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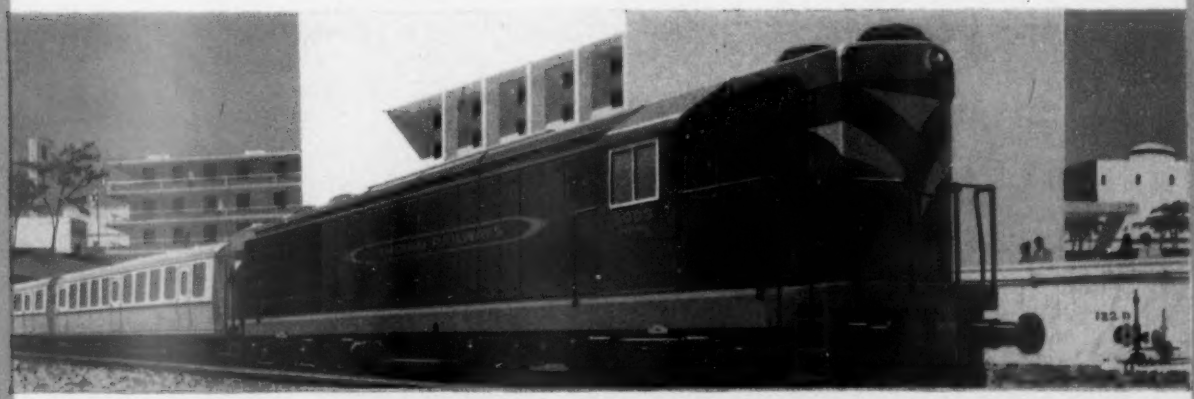
Indian Railways purchase 70

GENERAL MOTORS LOCOMOTIVES

Designed and built specifically to meet Indian Railway specifications, 30 Model GA12, 1240/1150 H.P. metre-gauge units have been ordered for the North East Frontier Railway. 40 Model GT16, 2600/2400 H.P. broad-gauge units are being built for the Northern Railway. With deliveries beginning this year, these Diesel-Electric locomotives will help Indian Railways meet increasing traffic requirements, hauling heavy goods trains in time freight operations.



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Locomotive plants in the U.S.A. and Canada.
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GENERAL MOTORS LOCOMOTIVES

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Top quality may not be quite so rare as the four leaf clover, but be sure of obtaining the best by specifying *Osborn* engineers' cutting tools. The range available includes almost every type of engineers' cutting tool, and these are manufactured throughout from steelmaking to finished product within the same organisation.

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NIFE Steel Alkaline batteries are not finicky or fussy. Electrically and mechanically, they take the rough with the smooth. Even severe shock and continuous vibration will not harm them.

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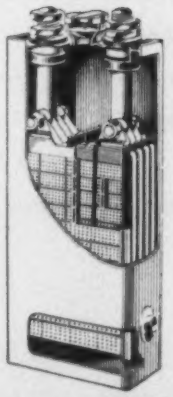

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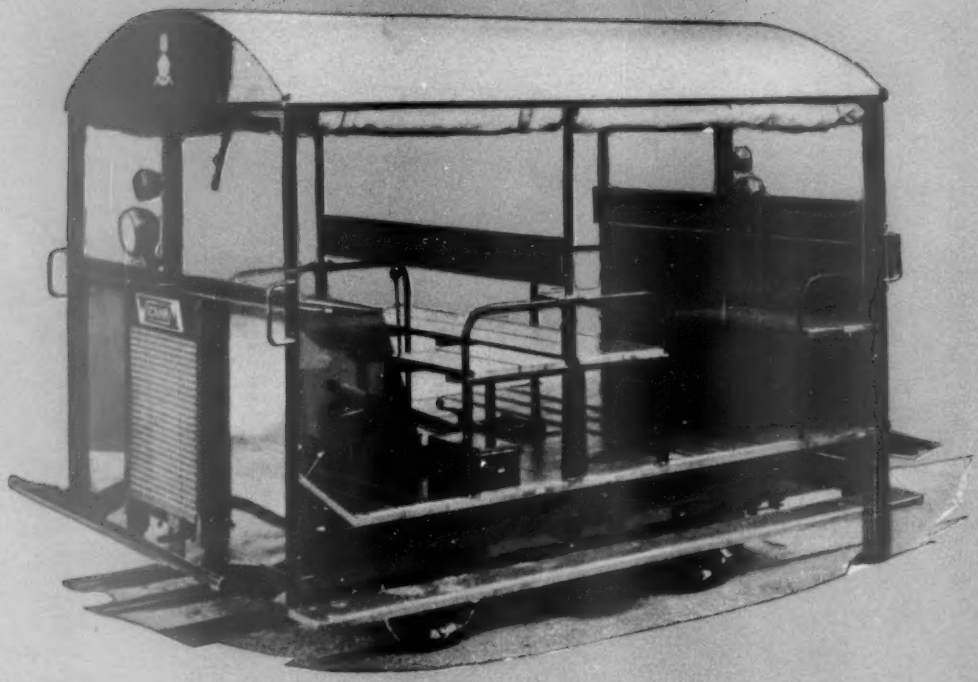

Modern track maintenance requires up-to-date mechanical equipment, of which the Motor Gang Car is the keypiece.

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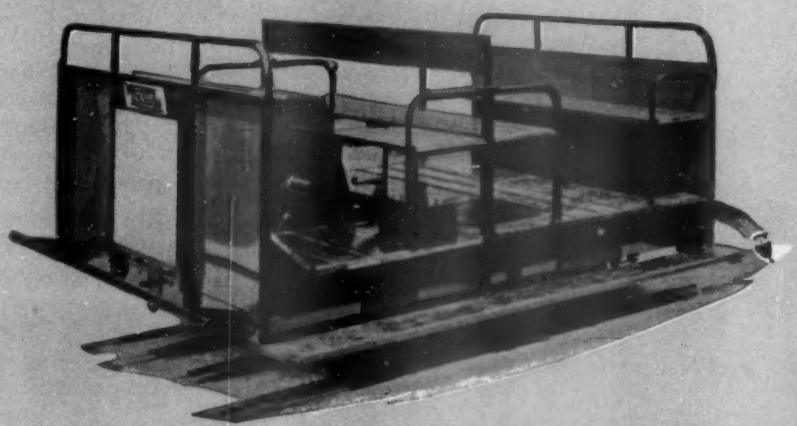

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LONDON TRANSPORT'S LIGHTWEIGHT TRAINS

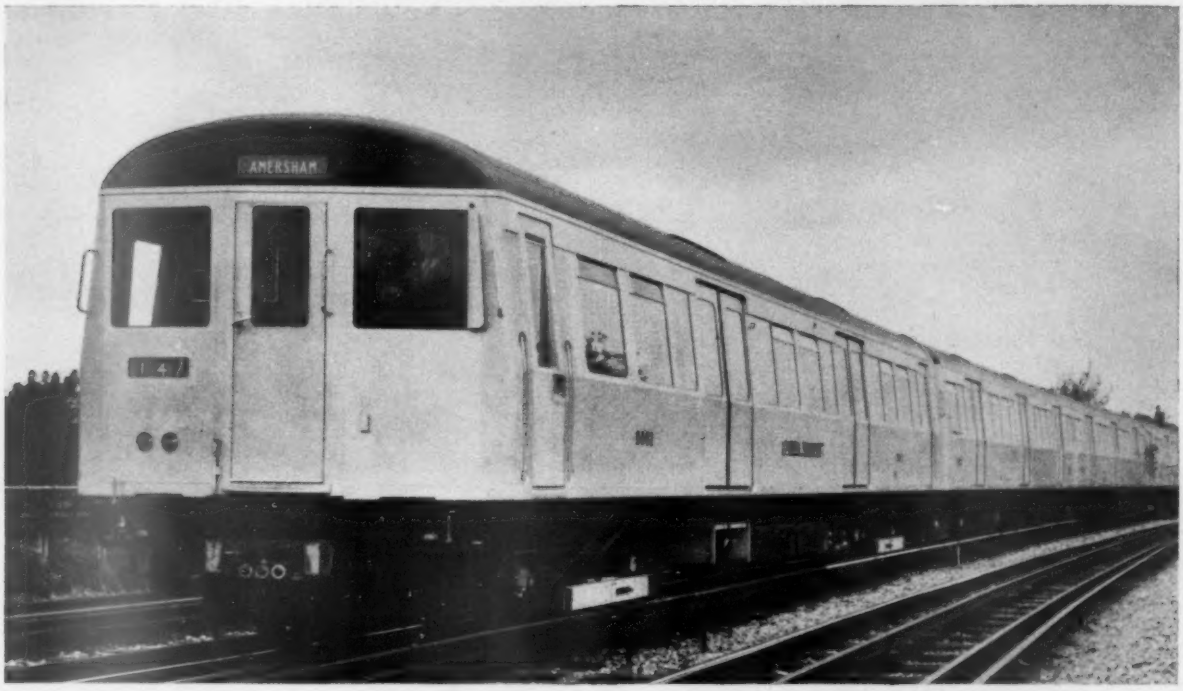

Photo by courtesy of London Transport Executive. *New eight-car train of A.60 stock.*

The first trains of London Transport's new light alloy cars for the Metropolitan Line to Amersham, Chesham and Watford are now in service.

The advantages gained by the modern construction and power equipment of these trains are supplemented by the effectiveness of their brake equipments.

These are the latest

WESTINGHOUSE

SELF-LAPPING
ELECTRO-PNEUMATIC BRAKES
WITH RETARDATION CONTROL

giving smooth and powerful braking so necessary to deal with the varying demands of the Metropolitan Line with its short in-Town sections contrasting with the well-spaced stations outside London.

The cars were built for ***London Transport Executive*** *by* ***Cravens Ltd.,*** *and the brakes were made by:—*

Westinghouse Brake and Signal Co. Ltd., 82, York Way, London, N.1.

Associated in Australia with **Westinghouse Brake (Australasia) Pty. Ltd. Concord West, N.S.W.**

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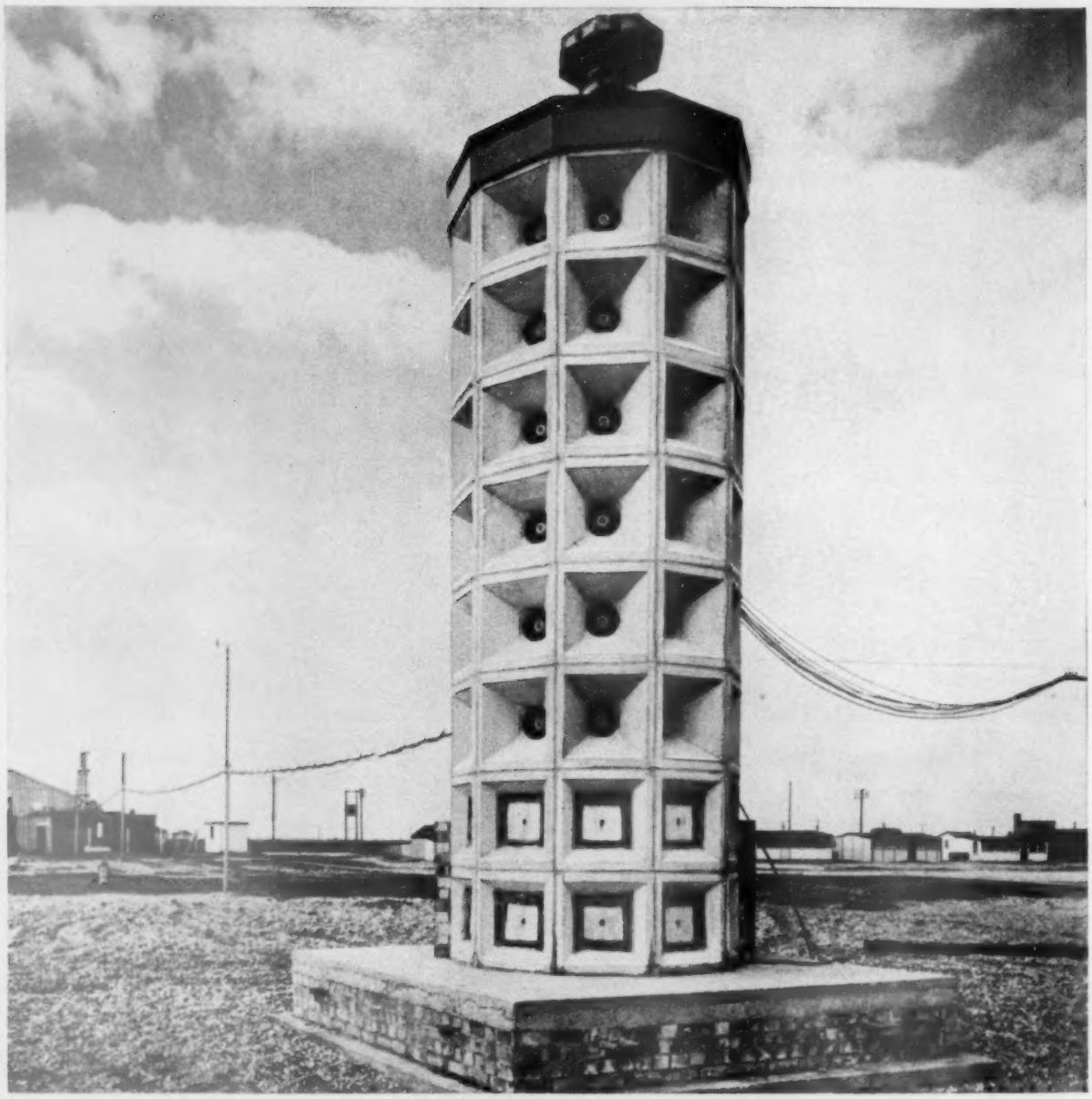

Photograph: courtesy of "British Communications and Electronics"

Among the latest means of increasing the safety of shipping, Trinity House has adopted electronically operated horns to warn seamen in fog.
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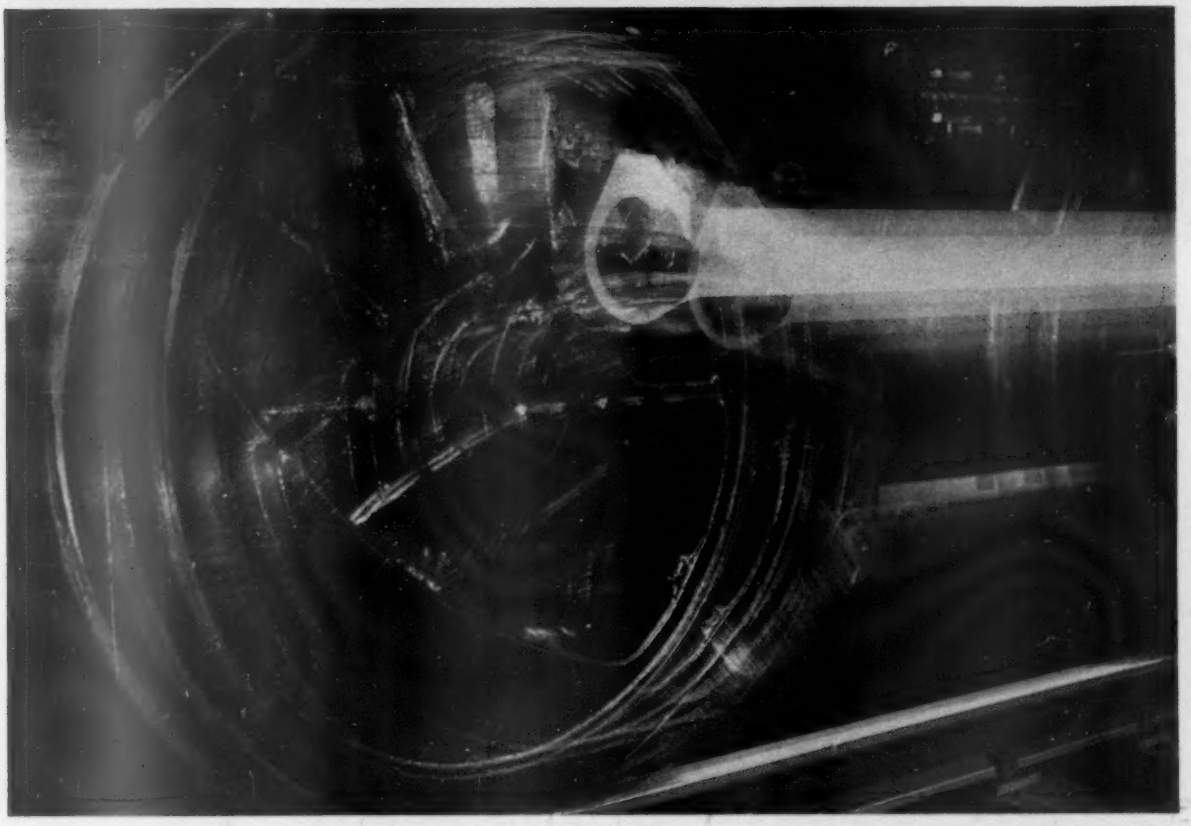

Hot steel is not to be trifled with. That's why Fowler diesel locomotives have been chosen again by the South Durham Steel and Iron Co. to serve their vast new plant at Greatham near West Hartlepool. Strictly-timed steel-making processes with associated handling problems similarly closely-controlled demand locomotives with immediate availability, high tractive effort and modest maintenance needs. These requirements, and more, are met by the Fowler diesels at Greatham working 24 hours a day.

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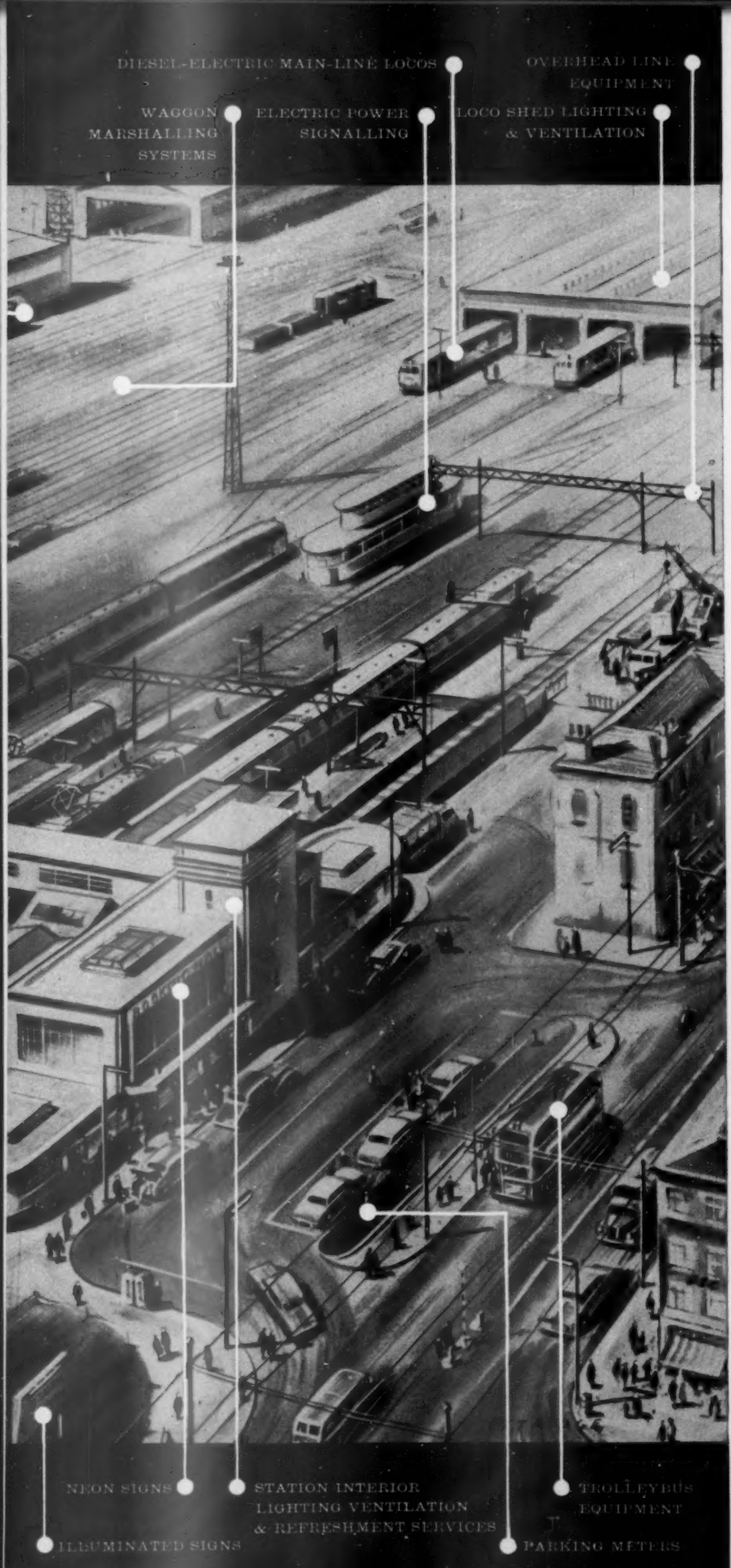

the picture tells the story

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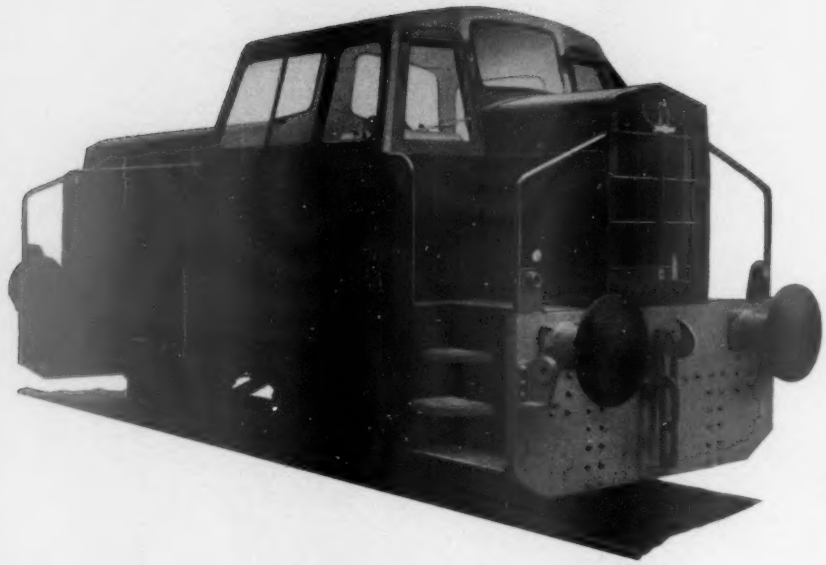

Sentinel chose

Laycock-Knorr

BRAKING EQUIPMENT

View of cab interior showing dual driver controls.

The new Sentinel 34 ton O-4-O Diesel Hydraulic Industrial Locomotives now going into service are all fitted with Laycock-Knorr compressed air brake equipment and pneumatic sanding gear.

This equipment, together with various other types of railway vehicle braking apparatus used extensively on the continent and developed by Knorr-Bremse of Munich over the last half century, is now manufactured and offered by

Member of the **Birfield Group**

Laycock

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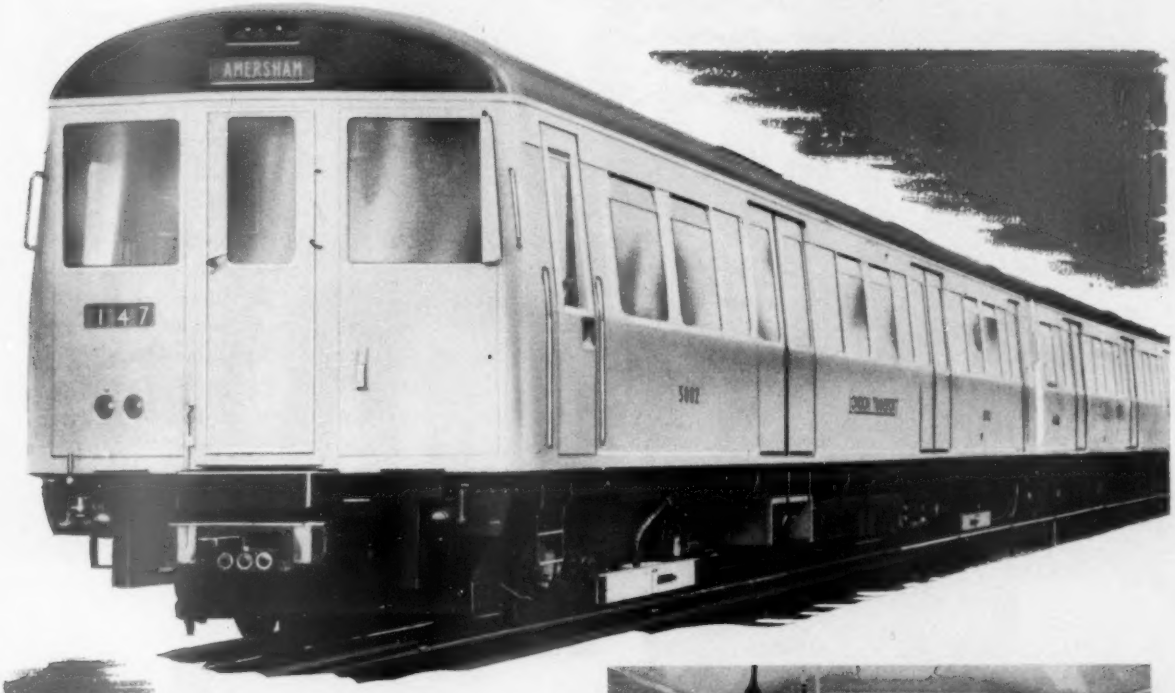
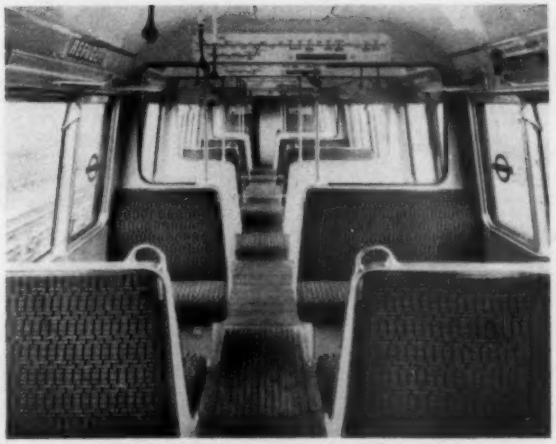
LONDON TRANSPORT

LIGHT ALLOY ROLLING STOCK





464 Electric Cars of
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of the London Transport Executive
are now being built

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ARCHITECTS FOR PASSENGER AND FREIGHT STOCK

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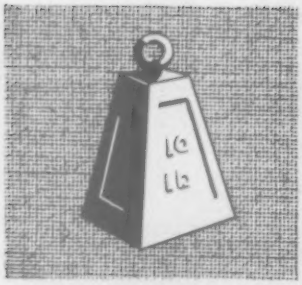

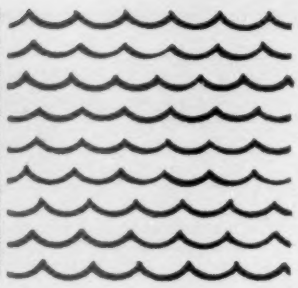

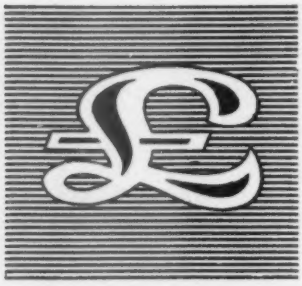

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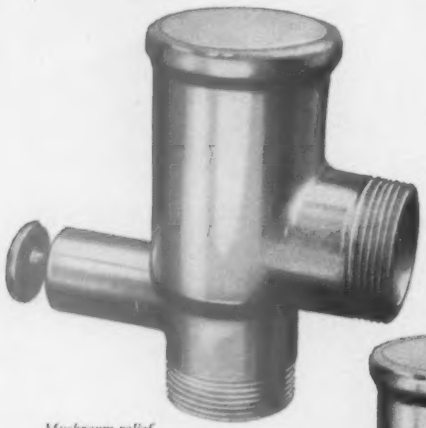
The trouble-free operation of these valves is determined by basically simple design, ensuring positive re-seating and instantaneous action. This same simplicity eliminates the need for small bye-passes so there is no risk of clogging.

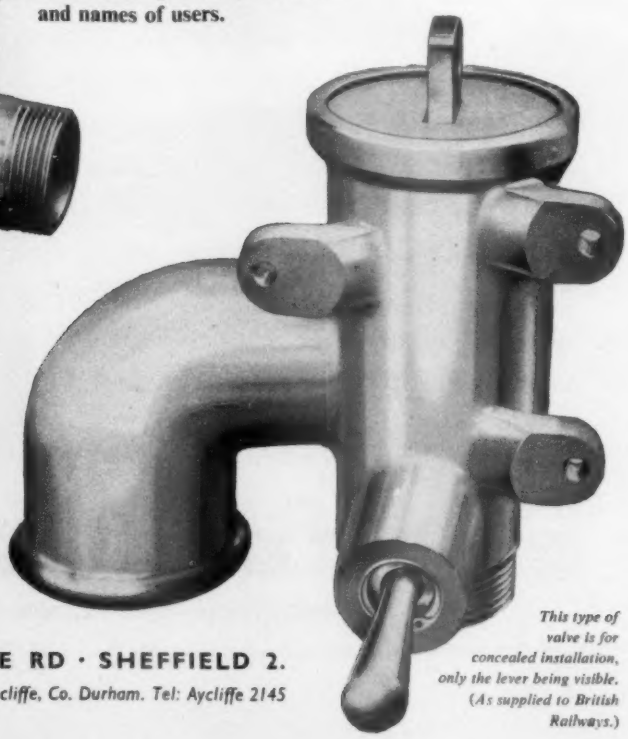
Available with trip lever or push button control as illustrated.

Write for explanatory literature and names of users.



Mushroom relief valve with push button control.

Mushroom relief valve with trip lever control.



This type of valve is for concealed installation, only the lever being visible. (As supplied to British Railways.)

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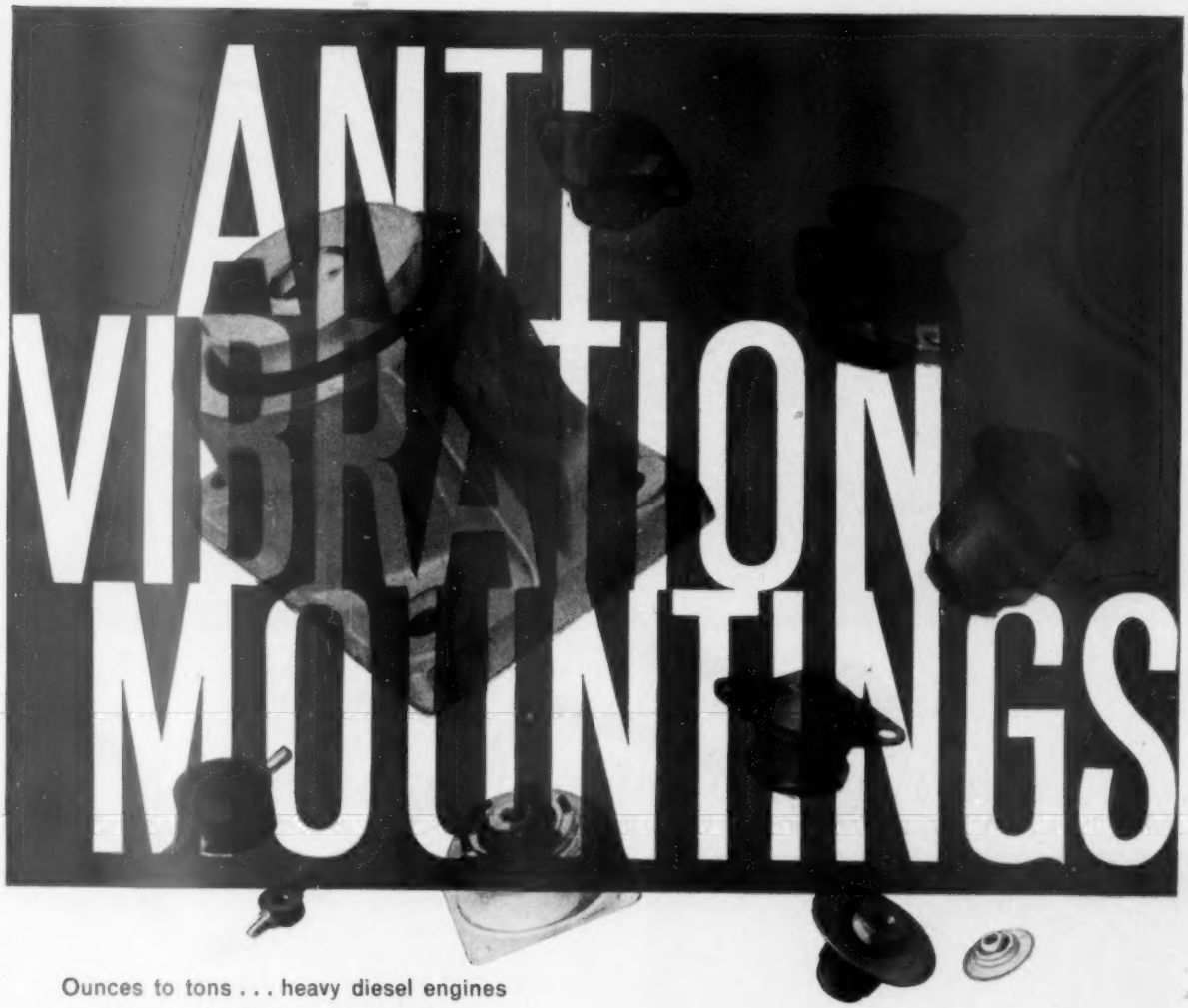

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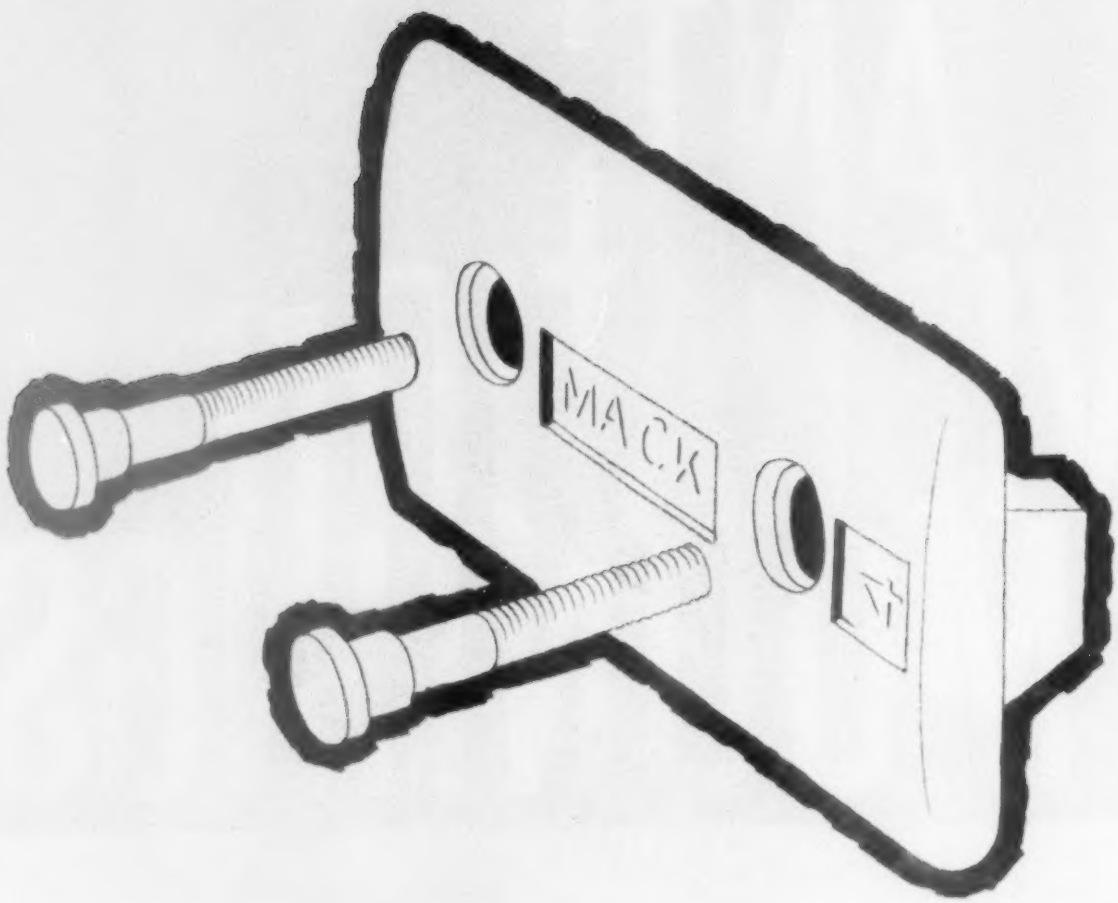

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Maybach diesels power the new Hymek locomotives

Bristol Siddeley Maybach* diesel engines have been chosen for the new Hymek diesel-hydraulic locomotives. 95 of these Type 3 locomotives have been ordered for main-line use on British Railways Western Region. This now brings the total order placed with Bristol Siddeley for British Railways to 286.

DESIGNED FOR ECONOMIC OPERATION

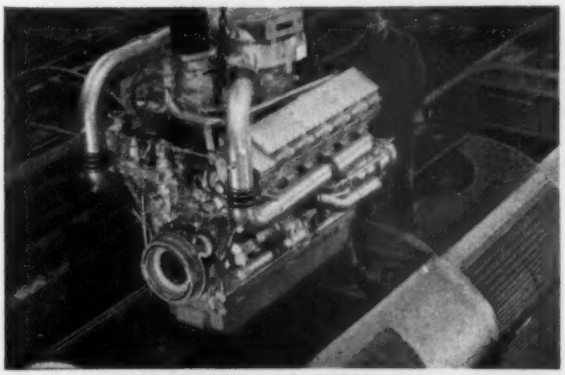
Bristol Siddeley Maybach rail traction diesel engines range from 384 to 2,000 hp and embody design features which produce more efficient operation in terms of lower wear, greater reliability and easier servicing.

The immensely strong, roller bearing disc-webbed crankshaft, for example, is extremely rigid in its tunnel housing.

Disc-webbed, roller bearing crankshaft and tunnel housing

This results in very low main and big-end bearing wear. The pressure-oil cooling of the pistons gives effective heat dissipation which reduces liner and gas ring wear to a minimum.

Since the majority of components are identical in all models, spares stocks can be cut and servicing is simplified through interchangeability.



Maybach diesel engine being installed in D800 Class at Swindon.

WORLD-WIDE SERVICE

Maybach engines are in service all over the world, and have built for themselves an unsurpassed reputation as the most efficient diesel engines of today. This reputation, backed by the efficient Bristol Siddeley after-sales and spares service, offers the most satisfactory solution to all rail traction requirements.

For further information, please write to: Power Sales Manager, Power Division, Bristol Siddeley Engines Limited, PO Box 17, Coventry, England. Cables: Brisidair, Coventry.

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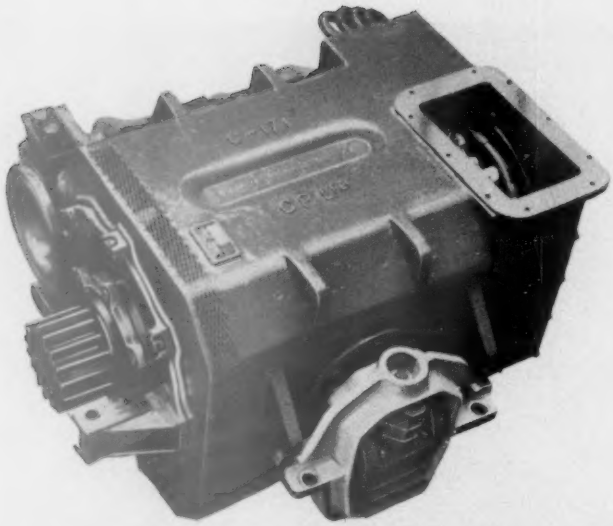
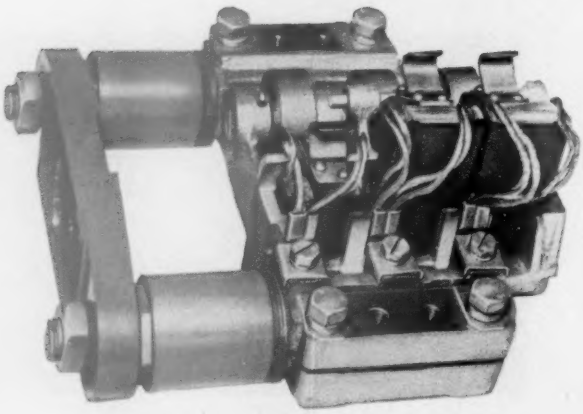


Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on know-how or experience.

This thing called know-how



Look at this brush-box from a traction motor; an ordinary enough piece of equipment but nevertheless embodying a great deal of experience. Note for example the very heavy insulators made from an unshatterable, non-tracking synthetic material vastly superior to porcelain. Note how the spring can be disengaged so that the brushes are easily slipped out for inspection and that the pressure on each brush can be adjusted separately. Where, owing to the design of the locomotive, there is no access to the top of the motor, the brushgear is mounted on a ring, normally clamped and dowelled in position but, when released, capable of being racked round by a gear engaging teeth in its periphery to bring each set of brushes in turn to the position from which they can be most easily reached. It is on details of this kind that performance in service depends.

Crompton Parkinson LIMITED

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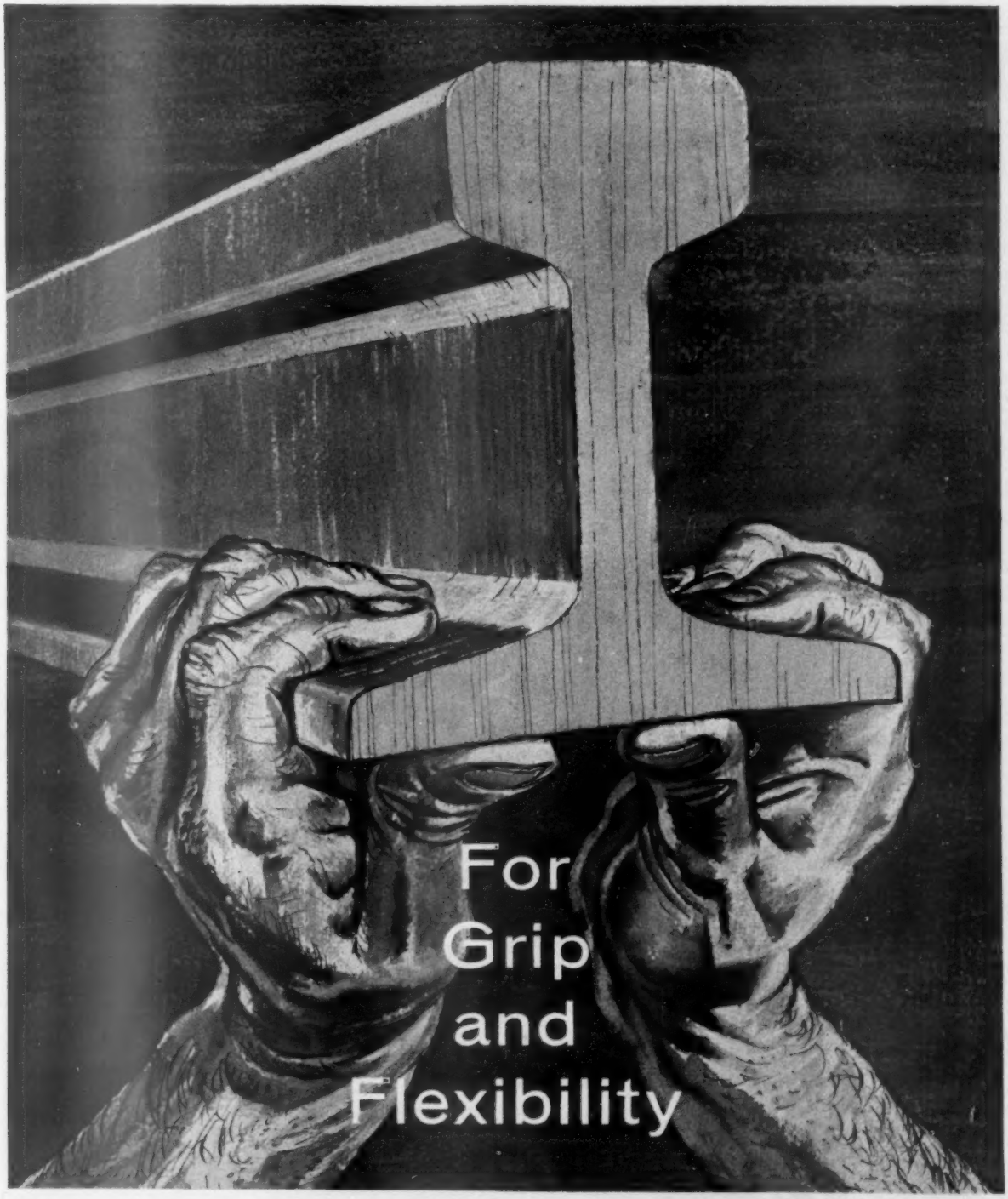

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Builders of locomotives and railcars, and operators who are considering redesigning and re-engining existing equipment, are invited to write to:

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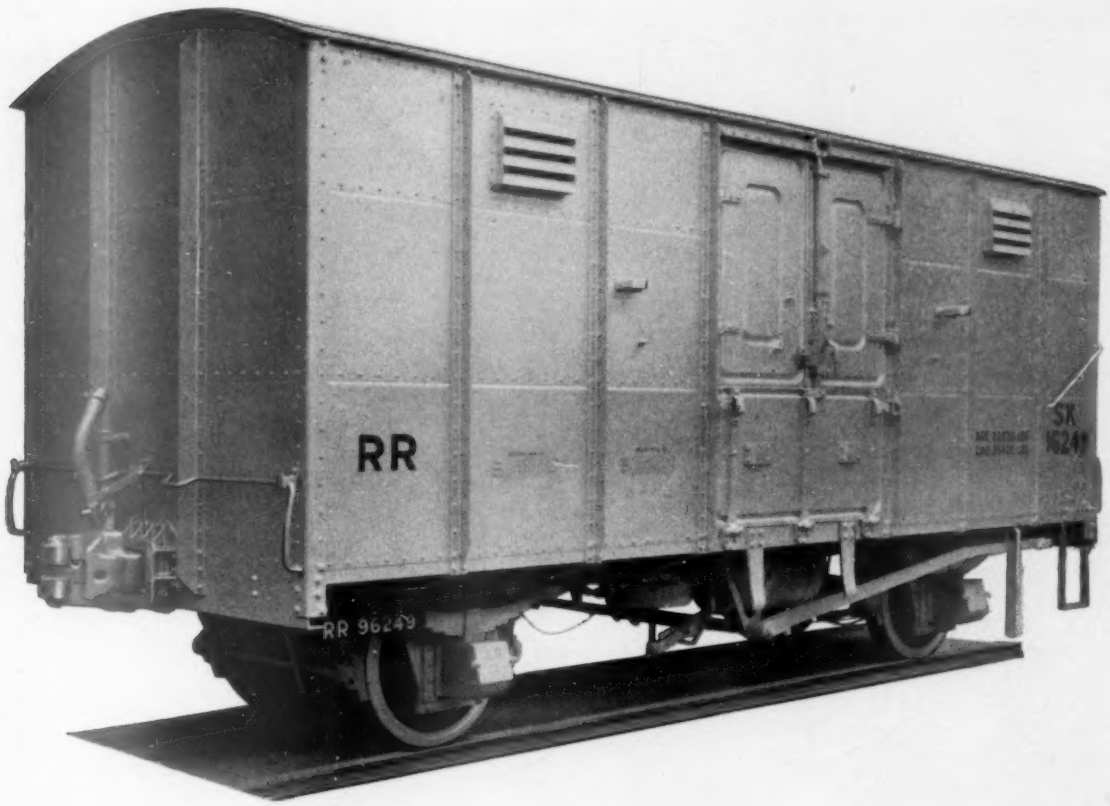

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Covered Wagon for the Rhodesia Railways built by Charles Roberts & Co. Ltd., Wakefield, with Axleboxes and Steel Castings supplied by us.

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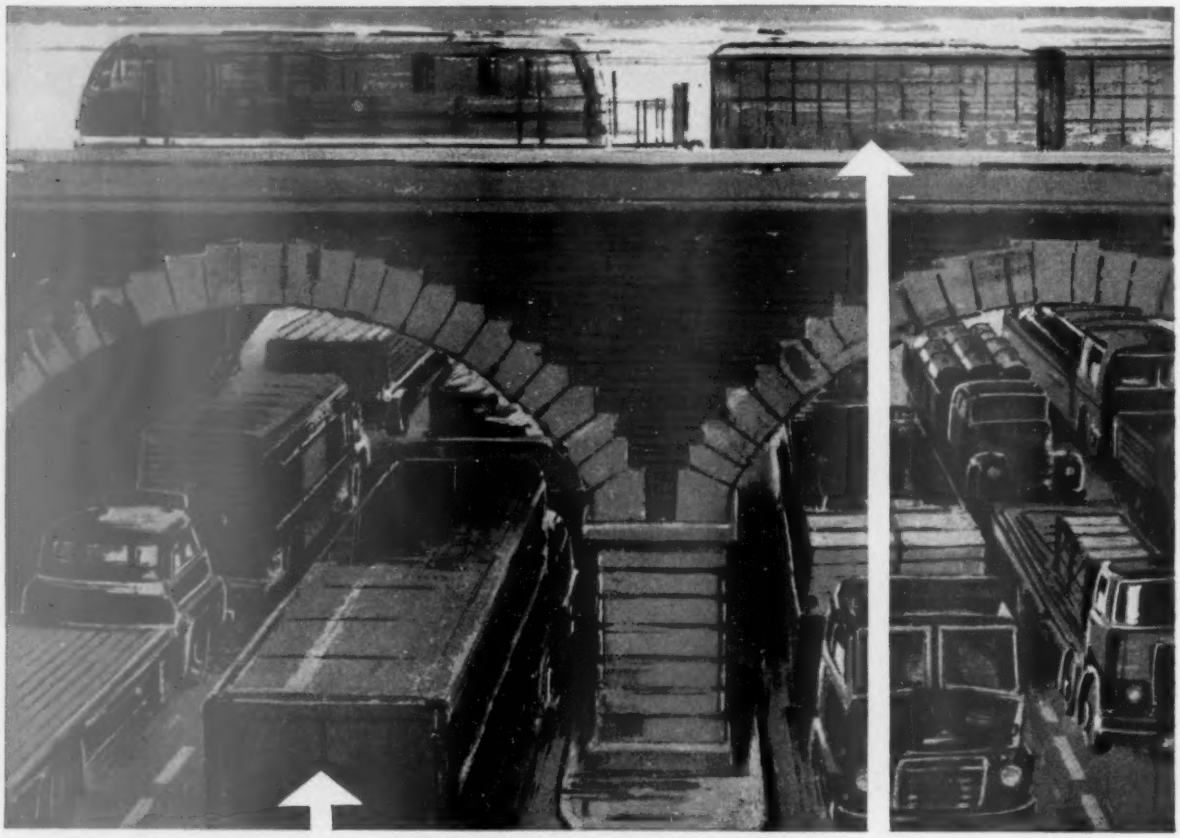
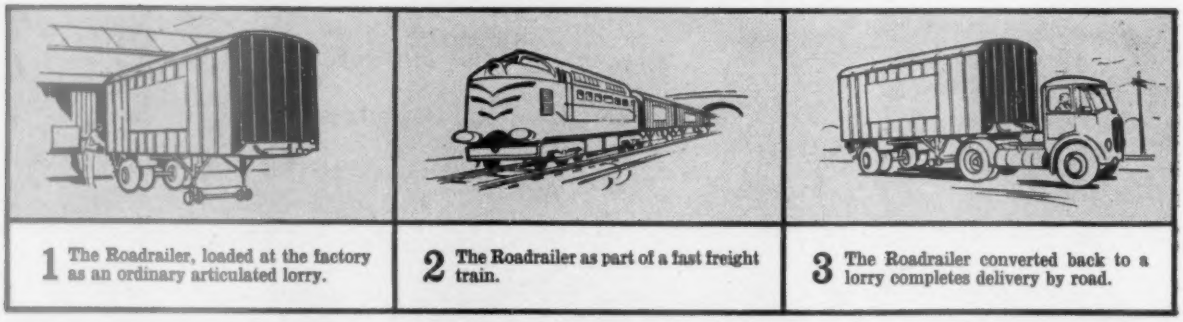


This lorry... could be up there if only it were a Roadrailer!



1 The Roadrailer, loaded at the factory as an ordinary articulated lorry.

2 The Roadrailer as part of a fast freight train.

3 The Roadrailer converted back to a lorry completes delivery by road.

What have roads got that railways haven't? Door-to-door service on the same vehicle. They also have something else—traffic jams! These can make a potentially fast service into a frustratingly slow one.

The railway's fundamental equipment is the permanent way and on direct hauls it is the cheapest form of overland transport. To neglect its clear-cut advantages on long and medium trunk hauls does not make sense.

Now the Roadrailer gives the obvious answer. It is a road vehicle that is transferred on to the permanent way in 150 seconds by letting down rail wheels. It can be adapted for any traffic including liquids, timber, cement. It coddles its loads with a suspension so smooth that a threepenny bit has been made to stand on edge at 65 m.p.h.

Feed railheads by road; trunk between railheads by rail. That makes sense. And now the Roadrailer can achieve it as a practical, profitable proposition.

150 SECONDS — YOU CAN HAVE THE BEST OF BOTH WORLDS

PRESSED STEEL CO. LTD.

Railway Division,
Linwood Factory, Paisley, Scotland

LONDON OFFICE: Railway Division, 47 Victoria St., London, S.W.1. HEAD OFFICE: Cowley, Oxford. BRUSSELS OFFICE: 2301/2307 Centre International Rogier, Passage International 6, Brussels 1, Belgium. Manufacturers of car bodies, Prestcold refrigeration equipment, all kinds of pressings and executive aircraft.

SLM

90 years experience in design and manufacture of locomotives and railcars!

50

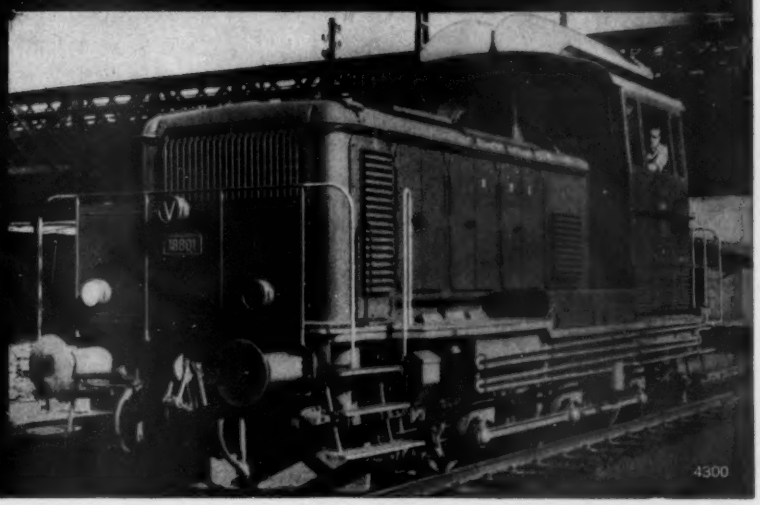
of these 6000 HP Co-Co type locomotives are giving excellent service on the Gothard and the Simplon lines of the Swiss Federal Railways.

24

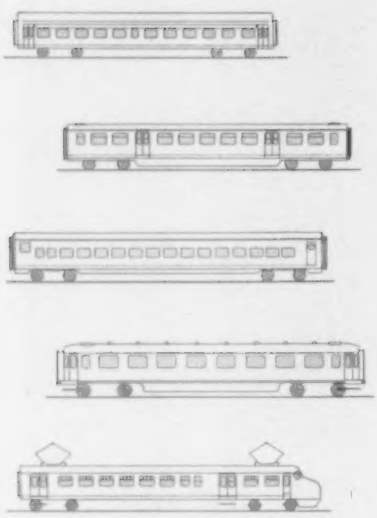
To meet traction requirements due to increasing traffic 24 more of these powerful and reliable engines have been ordered lately.

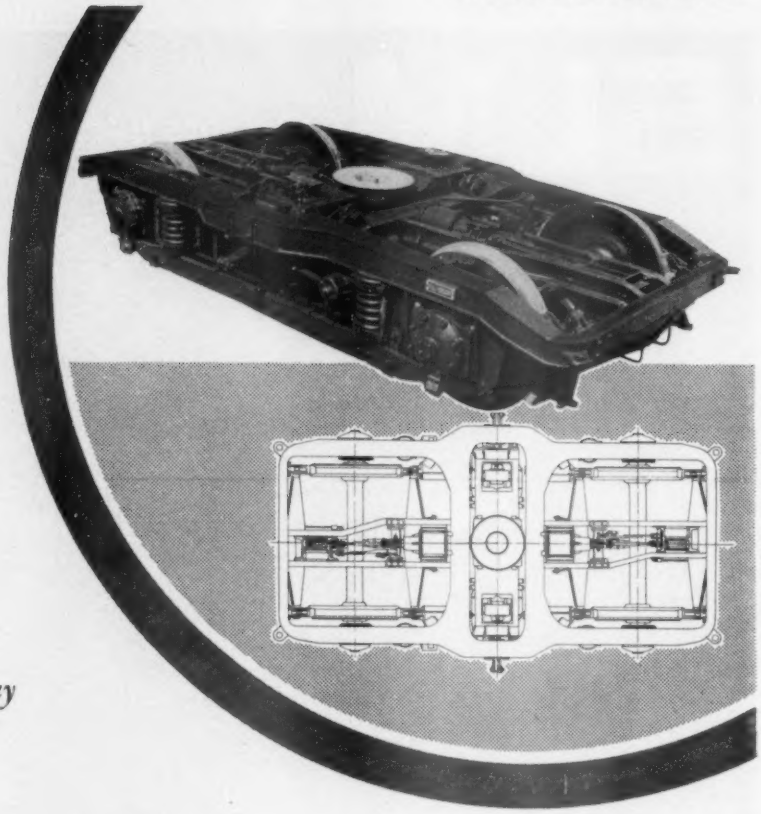
35

A further contract for the supply of 35 Diesel-electric locomotives, 600 HP each, fitted with SLM traction Diesel engines has also been placed by the Swiss Federal Railways.



Swiss
Locomotive and Machine Works
Winterthur





Worldwide satisfaction to railway men and passengers alike:

Werkspoor integral coaches

For 26 years Werkspoor has been building all-welded integral coaches - many thousands of them. Just a few of the many different types are illustrated here.
Werkspoor integral coaches are light, strong and highly finished. For the design of the interiors, specialist architects are employed.

An important contribution to passenger comfort is the Werkspoor design of bogies.
They ensure perfectly smooth running.

Werkspoor Rolling Stock Department is at your disposal to solve your problems.
More than a century of experience is at your command.

WERKSPOOR

WORKS AT UTRECHT

Baudoin

The "Margam Abbey"—built for the Port Talbot Pilotage Authority by Richard Ironworks Ltd., in which Cor-Ten was used extensively. Photograph by courtesy of the Port Talbot Pilotage Authority

COR-TEN GOES DOWN TO THE SEA IN SHIPS

At sea as well as ashore new uses are constantly being found for SCW Cor-Ten. It was used extensively in the construction of this vessel for the Port Talbot Pilotage Authority.

The Main Deck and Bulwark Plating
Shell Plating and Anchor Recess
Floors and Engine Seating
Chain Locker
Fresh Water Tank
Bulkhead Bottom Plating
Rudder Side Plates

—were made entirely from Cor-Ten. A typical example of the growing use of Cor-Ten in marine construction, and in other fields where high yield strength, together with outstanding resistance to corrosion, is vital.

COR-TEN IS TOUGHER

Weight for weight, the yield strength of SCW Cor-Ten is 50% higher than ordinary mild steel.

Alternatively—
Strength for strength, a saving of 1/3 of the weight is possible.

4-6 times more resistant to atmospheric corrosion. Highly resistant to abrasion and fatigue.

COR-TEN SAVES MONEY

Initial costs are spread over a longer service life.

Maintenance costs are reduced.

Operating costs are lowered—in transport, payloads are bigger because of reduction in tare weight.

Please write to us at the address below for further information or for technical assistance in the application of SCW Cor-Ten to your products.

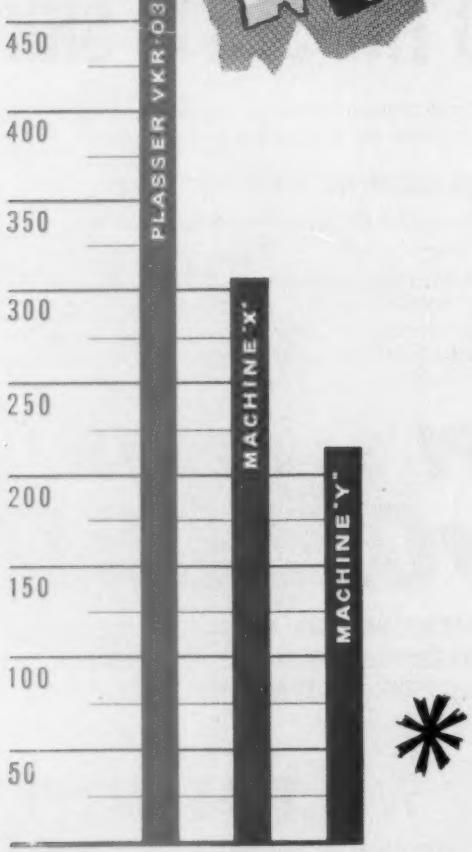
S·C·W BRAND Cor-Ten

RAILWAY ROLLING STOCK. AGRICULTURAL AND EARTH-MOVING EQUIPMENT. MINE CARS. POWER STATION INSTALLATIONS. BARGES AND SMALL CRAFT

THE STEEL COMPANY OF WALES LIMITED

Sales Offices: United Kingdom—Abbey Works, Port Talbot, Glamorgan. Overseas—Margam House, 26 St. James's Sq., London, S.W.1

outstanding achievement!



Remarkable results from Board of Trade Test carried out last May on three different manufacturers' normal production models on-track tamping machines. The results proved conclusively that the PLASSER VKR-03 is far superior to its competitors, both in speed and quality of work.

The test was carried out on a Class ' A ' track, average speed 75/80 m.p.h. 95 lb. B.H. material, 60′ rails, timber sleepers, on a compounded curve 62-85 chains radius, having cants of 3″ and 2″ respectively.

COMPARATIVE TESTS OF ON-TRACK BALLAST TAMPING MACHINES

The limits laid down were as follows:

i. For longitudinal level—Rate of change not to exceed $\frac{3}{16}$″ in 15′ 0″.
ii. For cross level—Variation not to exceed $\pm\frac{1}{4}$″.
iii. For voids—Not to exceed $\frac{1}{8}$″.

The results obtained were:

Quality of work		*Machine 'X'*	*Machine 'Y'*	*PLASSER VKR-03*
Percentage inside *acceptable limits, immediately after tamping.*	*Longl. Level*	77½	77	91
	Cross Level	28	59	77
	Voids	92	93	98
—ditto— three weeks later	*Longl. Level*	78	77	93
	Cross Level	8	41	45
	Voids	95	87½	98

Following the second set of measurements it was found:

(1) The cross level errors *outside* the acceptable limits on the Plasser length were reasonably constant and of the order of $\frac{3}{16}$″ to $\frac{1}{4}$″.

4½ months after the trials the following measured shovel packing was found to be necessary:

i. Machine ' X ' 95% of the test length was re-worked.
ii. Machine ' Y ' 83% of the test length was re-worked.
iii. PLASSER VKR-03 6% of the test length was re-worked.†

(†*This work was not necessary until two weeks before this report!*)

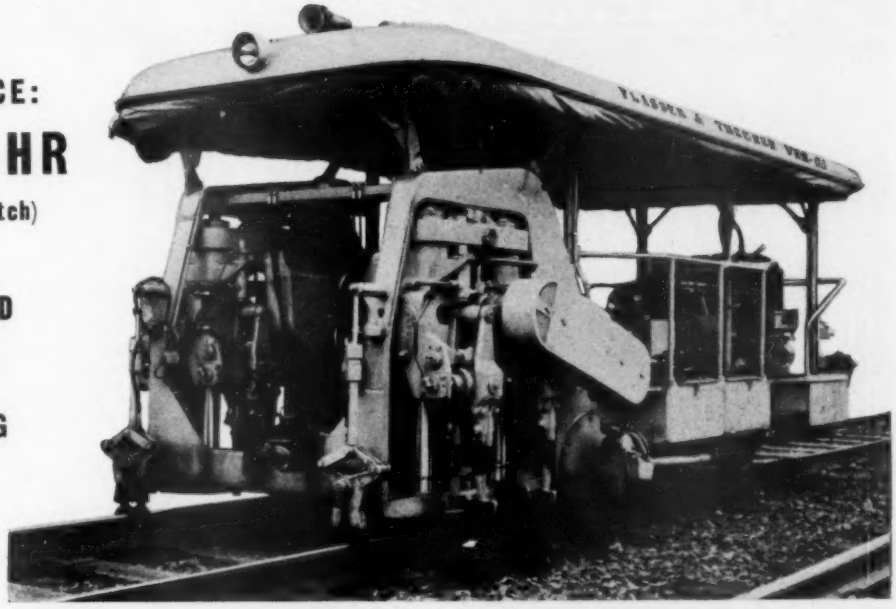
. . . for the PLASSER VKR-03

PEAK PERFORMANCE:

710 YARDS/HR

(According to sleeper pitch)

NON-SYNCHRONISED
FULLY HYDRAULIC
ON-TRACK TAMPING
MACHINE



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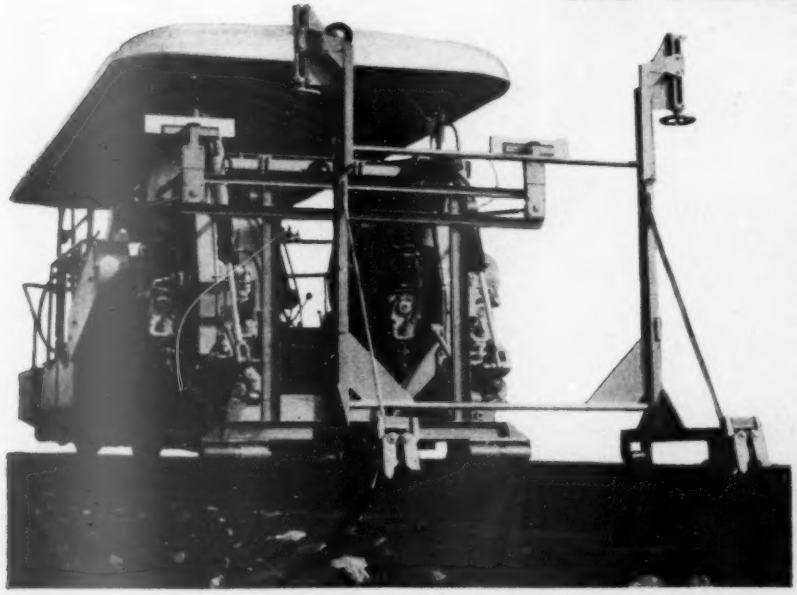
now BRITISH TRANSPORT COMMISSION order 20 of the new model—

the PLASSERMATIC VKR-04

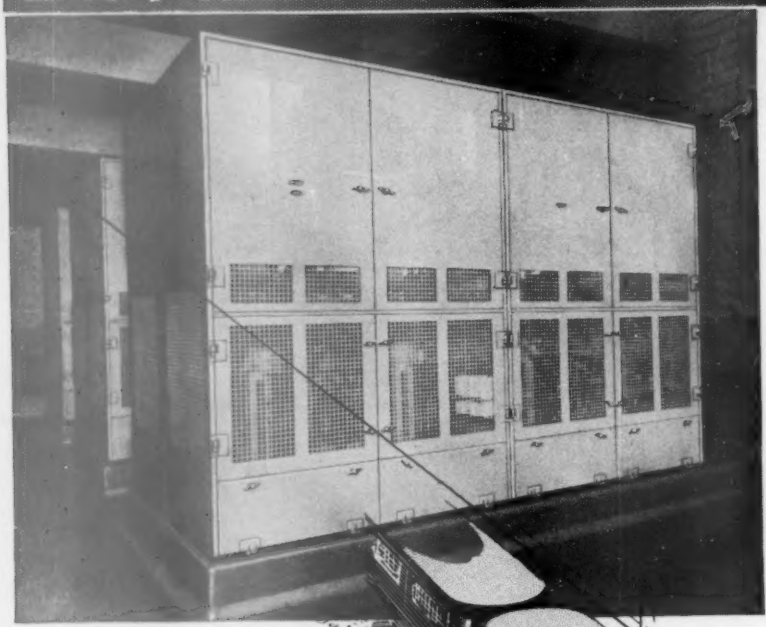


The PLASSERMATIC VKR—04 Model has all the test-winning features of its predecessor but has, for the first time ever, levelling, lifting and tamping operations carried out *all by the same machine!*

For further information on the PLASSER range of Railway Track Maintenance Equipment, please contact:

PLASSER RAILWAY MACHINERY (G.B.) LIMITED
77-79 Charlotte Street, London, W.1, England
Telephone: MUSeum 4797

In Traction Service in 18 Countries



A typical Hewittic Rectifier substation for heavy traction supply.

THE selection of HEWITTIC RECTIFIERS for the operation of important D.C. traction systems in 18 *countries* is in itself a testimonial to their eminent suitability for traction supply.

They have proved ideal for this purpose because they are exceptionally efficient at all loads, with very small no-load losses (assuring great economy in operation), and are unaffected by the heavy fluctuating loads and short circuits of traction service. Amazingly simple to instal; normally housed in *unattended* substations; of unit-cubicle construction (affording great flexibility of layout); robust electrically and mechanically.

They are backed by a wealth of specialised experience from fifty years of rectifier manufacture.

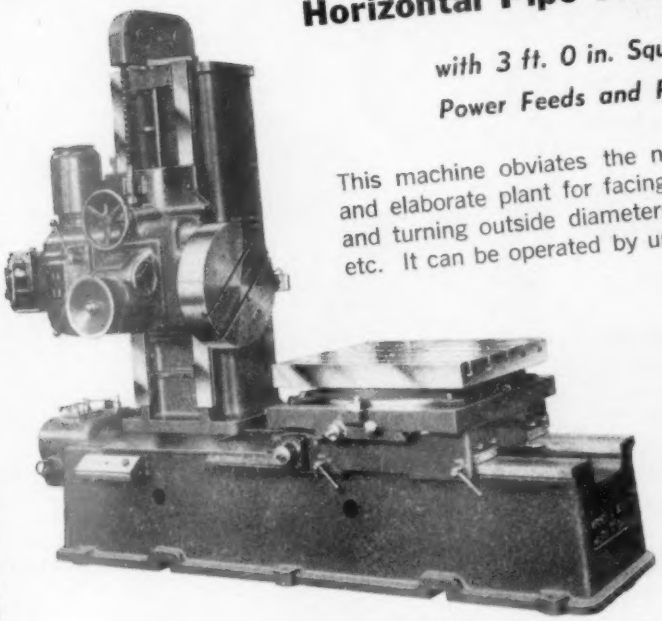
OVER 1¼ MILLION kW. IN WORLD-WIDE SERVICE

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES · SURREY · ENGLAND
Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

K&W Equipment for the up-to-date Railway Workshop

Horizontal Pipe Flange Facing Machine

with 3 ft. 0 in. Squaring Table having Power Feeds and Rapid Traverse



This machine obviates the need to utilise more expensive and elaborate plant for facing, recessing, spigoting, grooving and turning outside diameters of pipe flanges, valve bodies, etc. It can be operated by unskilled labour and whilst low in initial cost it is a highly productive machine capable of taking full advantage of carbide tooling.

SPECIFICATION:

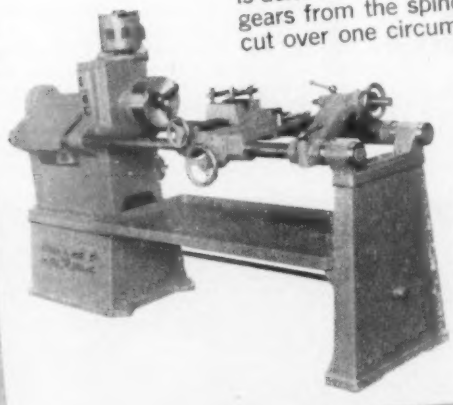
Facing head diameter	24 in.
Six facing head speeds ...	choice of 3 ranges
Two facing slide speeds (1 forward 1 reverse) ...	choice of 4 ranges
Facing slide length of feed	9 in.
Table size	3 ft. 0 in. square
Table cross traverse	2 ft.
Facing head drive	5 h.p.

Oil Grooving Machine

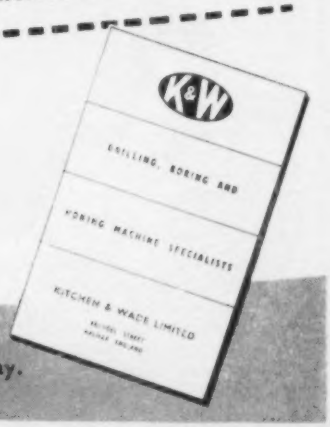
for internal and external work

A simple machine designed specially for oil grooving. The oscillating stroke of the saddle is derived from a crank driven by a train of gears from the spindle. A spiral groove is cut over one circumference on one half of the oscillation and back over one circumference on the second half making a figure eight. The stroke can be disengaged to cut ring grooves

Stroke is infinitely variable from 0–12 ins. Capacity, external work up to 5 in. dia. and internal work up to 7½ in. dia.



This 60 page catalogue illustrates and describes the range of K. & W. machines for the modern machine shop.



Write for this catalogue today.

KITCHEN & WADE LTD. *Member of the Asquith Machine Tool Corporation*

ARUNDEL STREET HALIFAX, ENGLAND *Telegrams* · *'KAW Halifax'. Telephone : Halifax 67744 (3 lines)*

LEH
DESIGNERS AND MANUFACTURERS OF HYDRAULIC EQUIPMENT

WHEEL PRESS

Robustly built on a fabricated steel frame of great strength but minimum weight, the machine illustrated is typical of the efficient and reliable special purpose presses which The Leeds Engineering and Hydraulic Co. Ltd., develop and manufacture to customers requirements.

THE LEEDS ENGINEERING & HYDRAULIC CO. LTD.,
RODLEY, LEEDS.
Tel. Pudsey 2859. Grams, "Pumps" Rodley.
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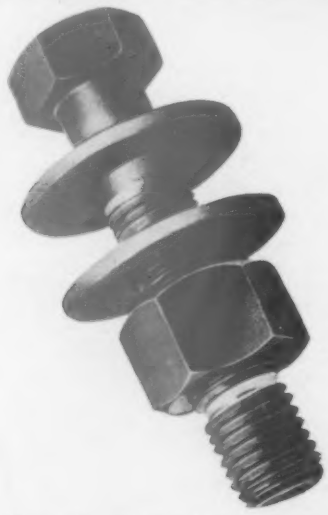
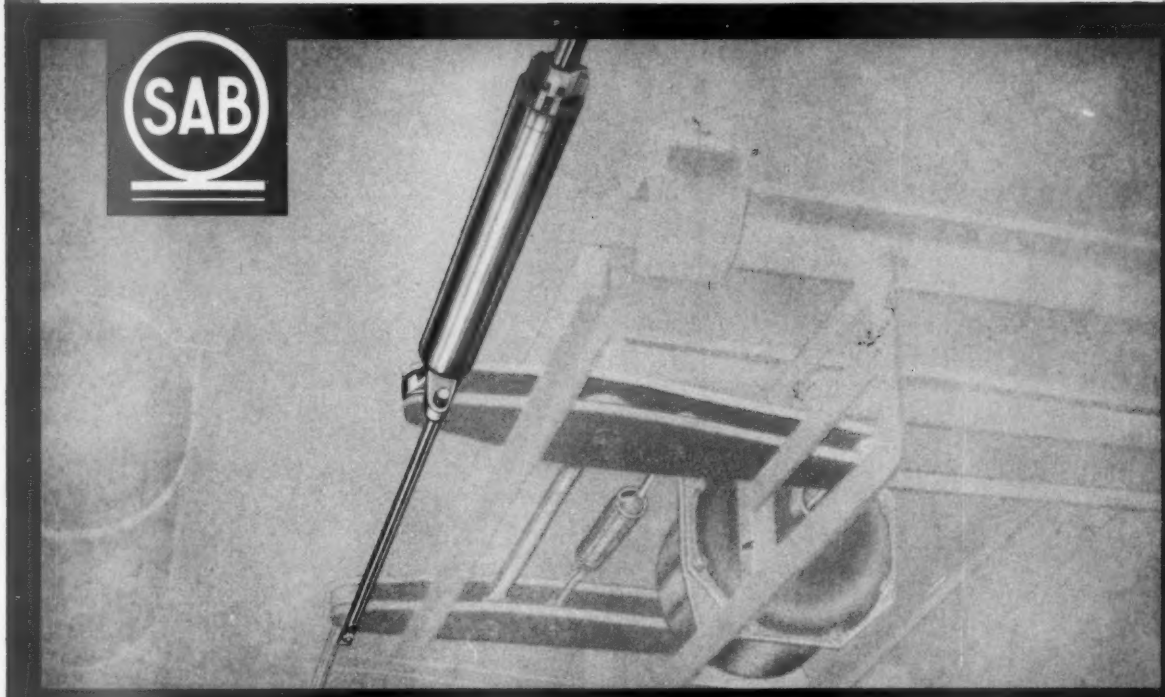


Newall TORSHEAR bolts— an automatic choice ensuring scientific loading

Newall TORSHEAR bolting is proving an effective and economical method of fastening on bridge steelwork for British Railways. The special benefits of the TORSHEAR method include:
One-man operation with the special air-tool; the onus of accurately loaded bolts is transferred from the wrench to the bolt—NO control is allowed to the operator; complete uniformity of loading—no over or under tightening; and inspection is limited to a visual check that all the bolt extensions have sheared.

A. P. NEWALL & CO., LTD.
POSSILPARK • GLASGOW, N.2
Also at London and Birmingham

SAB DOUBLE-ACTING RAPID-WORKING BRAKE REGULATOR TYPE DRV



IN MORE THAN 50 COUNTRIES

Although the productions of the SAB Company cover a wide range of empty/loaded braking devices, the product most closely associated by railway engineers with the symbol SAB is the double-acting, rapid-working SAB Brake Regulator.

SAB Brake Regulators have been delivered to leading Railways in more than 50 countries all over the world. In most of these countries, SAB Brake Regulators have been adopted as a standard component of the brake equipment. They have gained a reputation for efficiency and reliability, resulting in an ever increasing number of installations on all types of railway vehicles.

BRAKE REGULATOR TYPE DRV

The most advanced member of the SAB slack adjuster family is the fully automatic, double-acting, rapid-working Brake Regulator Type DRV, the result of more than 40 years of specialised experience of automatic slack adjustment.

The DRV regulator is built into the brake rigging as part of a pull rod. It rapidly takes up or pays out slack, thus maintaining correct brake block clearances. In addition it contributes to easier replacement of worn brake blocks, no manual adjustment being required after the operation. The DRV Brake Regulator also makes it possible to use a simple mechanical empty/loaded braking device.

TECHNICAL ASSISTANCE

Whenever brake slack adjustment and empty/loaded braking problems require an effective solution, it is advantageous to consult SAB.

The SAB Company has built up an important service organisation which, with its expert knowledge, is ready to deal with any problem relating to brake rigging and brake installation for all types of railway vehicles.

The SAB Service Engineering Department checks proposed brake rigging designs and provides detailed installation drawings as a service to customers. It also assists whenever necessary at the actual mounting on the vehicle.

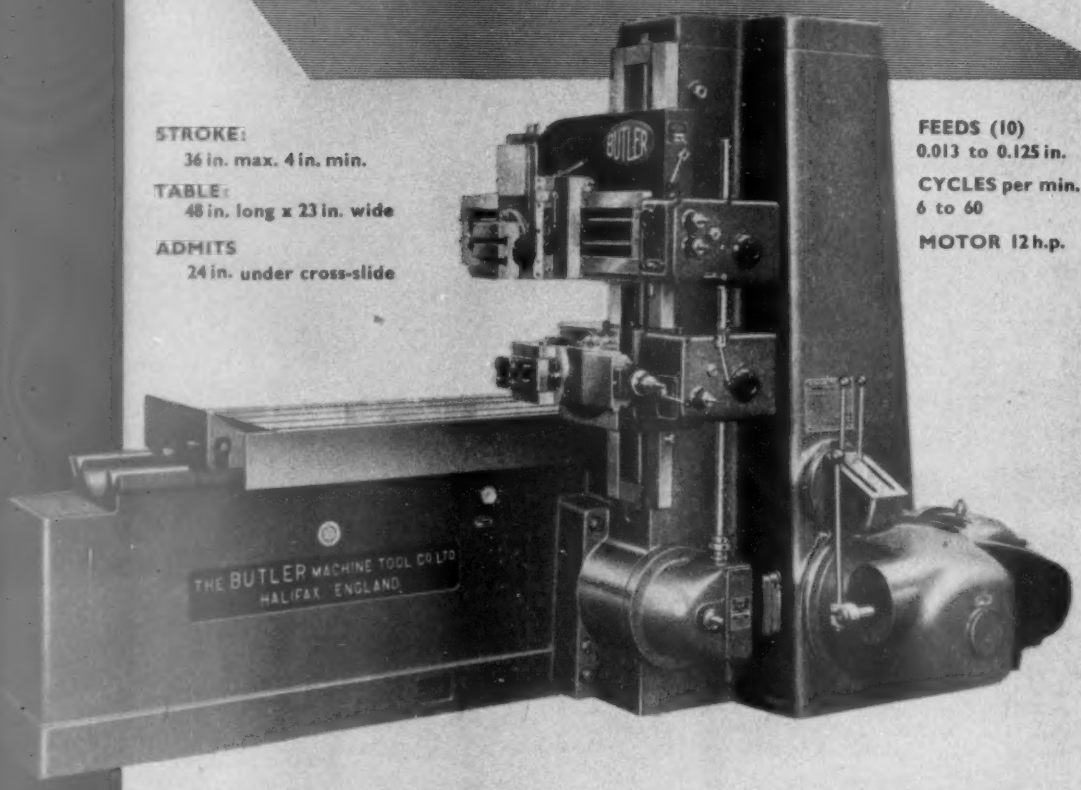
BROMSREGULATOR

MALMÖ — SWEDEN

Butler

36 in. stroke
Openside Planer

STROKE:
36 in. max. 4 in. min.
TABLE:
48 in. long x 23 in. wide
ADMITS
24 in. under cross-slide



FEEDS (10)
0.013 to 0.125 in.
CYCLES per min.
6 to 60
MOTOR 12 h.p.

The BUTLER MACHINE TOOL Co. LTD.
HALIFAX TELEPHONE 61641 ENGLAND

PLANING
SHAPING &
SLOTTING
MACHINES

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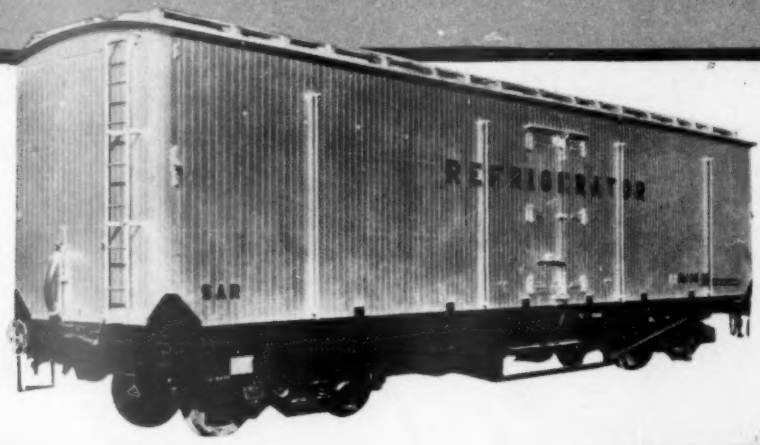
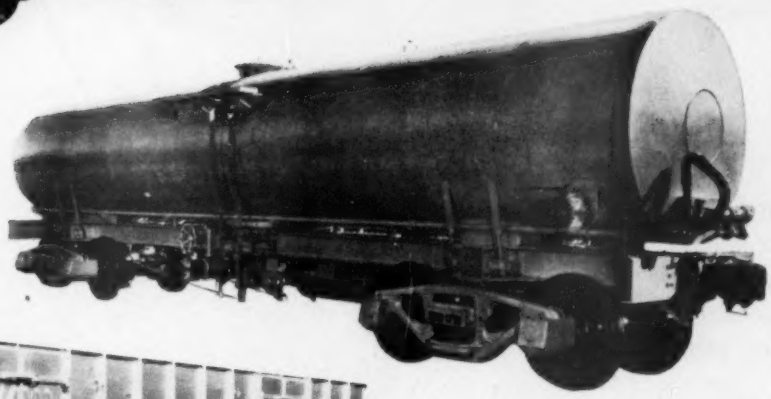
ROLLING STOCK WITH A FINE REPUTATION



Bogie Refrigerator Wagon— South African Railways

Bogie Tar Tank Wagon— South African Iron and Steel Industrial Corporation



High-sided Bogie Wagon— Rhodesia Railways

DORMAN LONG (AFRICA) LTD.

Germiston, Transvaal, South Africa

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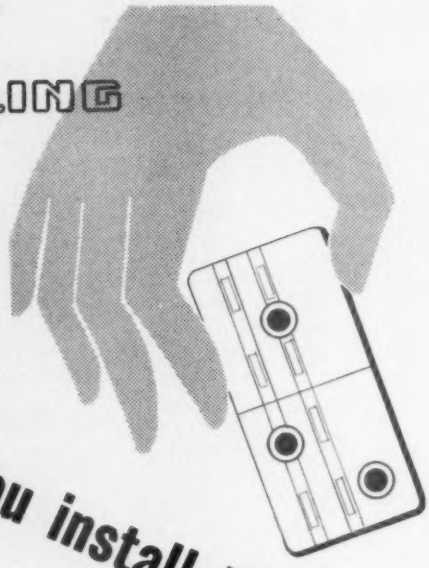
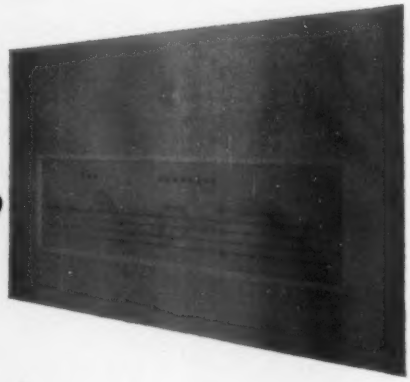
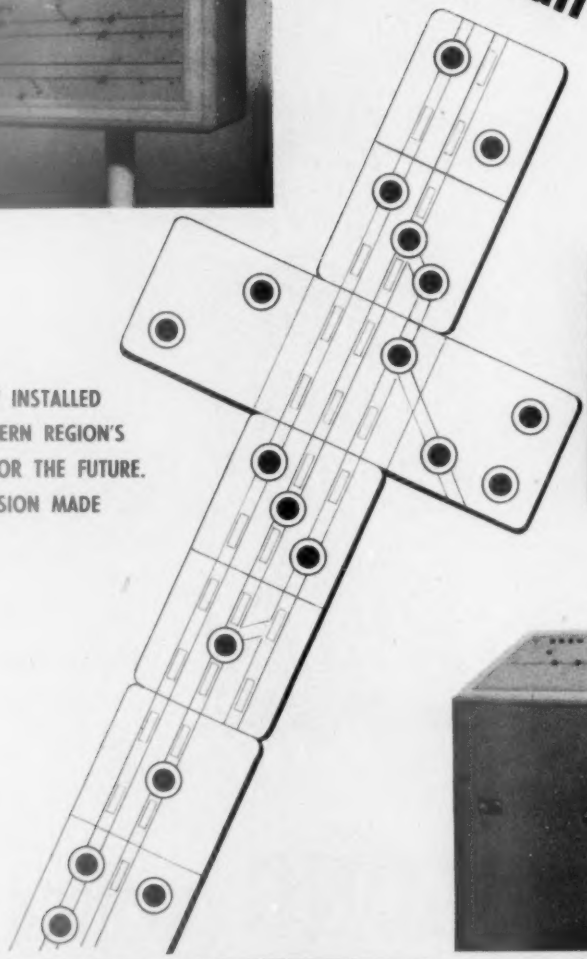
INTEGRA SIGNALLING

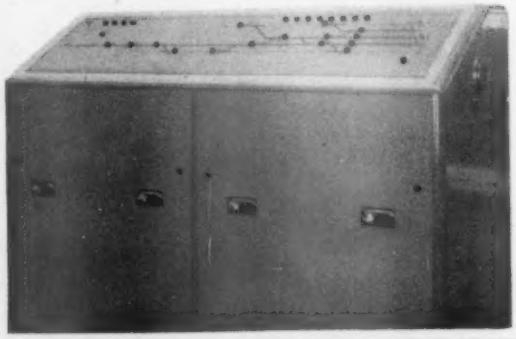


'A winning move' when you install Domino Panels



THESE PANELS RECENTLY INSTALLED ARE EVIDENCE OF WESTERN REGION'S CARE AND FORESIGHT FOR THE FUTURE. ASSEMBLED FROM PRECISION MADE UNITS THROUGHOUT.





HENRY WILLIAMS LTD

Telephone: RICKMANSWORTH 4321

HWD

ELECTRIC SIGNALLING DEPARTMENT

WATFORD

NORTHEY ROTARY EXHAUSTERS

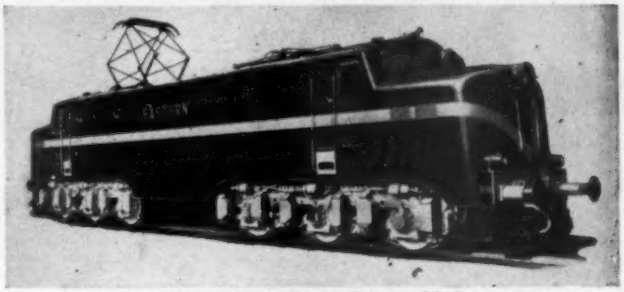
have been chosen by

'ENGLISH ELECTRIC'

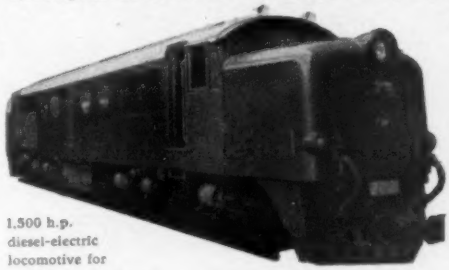
for these new locomotives

NEW FLANGE MOUNTED MODELS NOW AVAILABLE

2,000 h.p. diesel-electric locomotive for British Railways, Eastern Region.

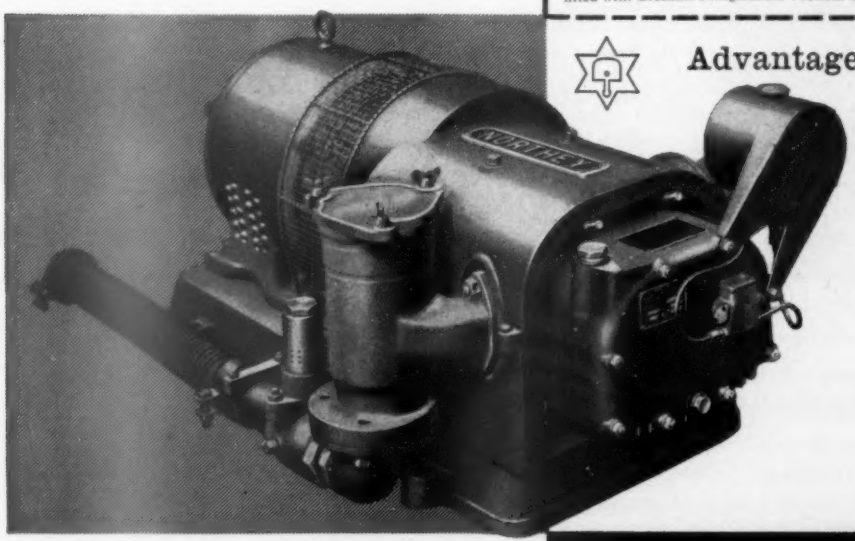


3,000 h.p. electric locomotive for the Eastern Railway of India.



1,500 h.p. diesel-electric locomotive for the Malayan Railway, fitted with Gresham's Augmented Vacuum Brake System for locomotive braking.

Acknowledgments to The English Electric Company Ltd; British Railways, Eastern Region; Eastern Railway of India and Malayan State Railway.



Advantages –

- LOW STARTING TORQUE
- LOW OIL CONSUMPTION
- NO PISTONS, NO VALVES
- NO SLIDING VANES

Available in four standard sizes giving 90 c.f. min., 125 c.f. min.,180 c.f. min., and 250 c.f. min at 1,500 r.p.m. Permissible speed range for continuous running 800-1,600 r.p.m.

In operation on British, Indian, Malayan, Thailand, Israel, Pakistan and many African Railways.

Northey Exhausters are manufactured for Gresham & Craven Limited by Northey Rotary Compressors Limited, Parkstone, Dorset.

GRESHAM & CRAVEN LTD

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TEL.: FAO 2041 (14 LINES) GRAMS BRAKE, PHONE, WALKDEN, MANCHESTER

1348

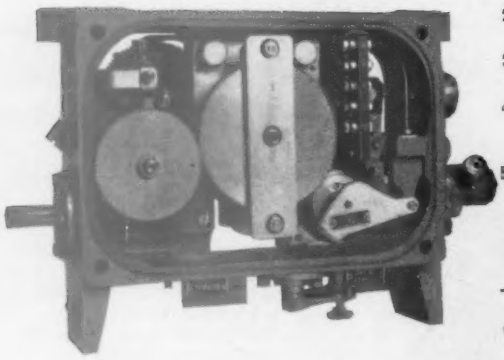
C

The Nigerian Railway Corporation have recently put into service two of these Twin Unit Diesel Railcars, supplied by the Drewry Car Co. Ltd., and built by Birmingham Railway Carriage & Wagon Co. Ltd. Each unit is fitted with Metcalfe-Oerlikon Patent Safety & Vigilance Control Equipment.

ANOTHER INSTALLATION OF THE

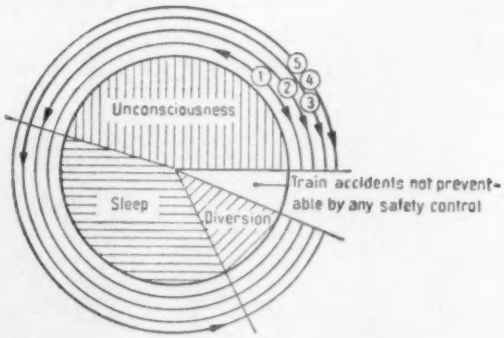
D & M

Automatic Safety &



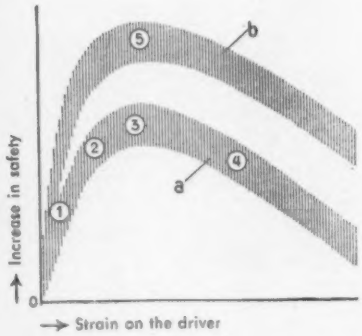
View of the safety side of the apparatus with the covers removed.

1 Normal Deadman's pedal.
2 Encased pedal for instep.
3 Sewing machine type pedal.
4 Pedal which must be periodically released.
5 Normal Deadman's pedal connected with the PATENT SAFETY and VIGILANCE CONTROL SYSTEM.



a Range of existing safety controls with pedals.
b Range of the Metcalfe–Oerlikon safety control.
1-5 Various pedal arrangements as fig. 1.

THESE CHARTS ILLUSTRATE THE SUPERIOR CONDITIONS AND RANGE OF SAFETY OBTAINED FROM THE SAFETY AND VIGILANCE CONTROL SYSTEM.



For full description write for leaflet A.41

DAVIES & METCALFE LTD.

METCALFE-OERLIKON

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Control System

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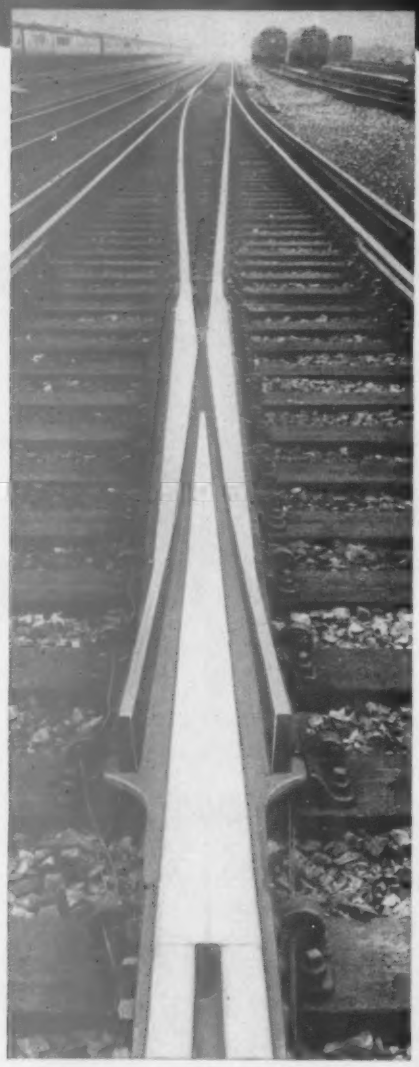

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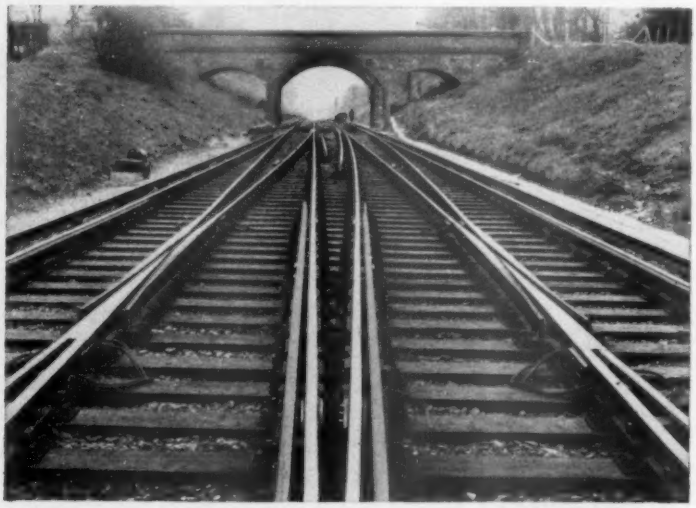
Photographs by courtesy of Southern Region, British Railways.



The double junction with 'G' type switches at Shortlands, where two tracks diverge into four (laid June 1958)

The underside of one of the castings

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Editor: B. W. C. Cooke, Assoc. Inst. T.

33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1

Telephone: WHitehall 9233 (24 lines)
Telegrams: "Trazette Parl London"
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Survey of industrial transport

ONE of the more important of the traffic studies which Dr. Richard Beeching, Chairman of the British Transport Commission, announced soon after he had taken office, has begun to take shape. Dr. Beeching has asked the National Union of Manufacturers, the Association of the British Chambers of Commerce, the Federation of British Industries, the National Farmers' Union, and the British Iron & Steel Federation, seeking the co-operation of their member companies and giving an assurance that all information supplied to the Commission will be treated as confidential. It is intended that the railway regions will seek to obtain from a very large number of employers, answers to questions designed to show what types of goods are manufactured or distributed, how the various kinds of manufactures are transported and their destinations. It is clear that the operation now being undertaken will take many months to conclude, but when all the information has been collected Dr. Beeching and his colleagues should be in a position to decide the general pattern of freight arrangements immediately necessary to serve industry's best advantage, and what improvements or modifications should be made to give an improved service to industry and at the same time increase the return to the railway system. There can be no doubt that much of the information which is being sought is already known at regional railway offices, but by bringing the material up-to-date, as a result of a direct enquiry, and presenting the whole in a comprehensive report, it should be possible to plan more precisely the railway network, having regard to the volume, directional flow, distance, pattern, present method of movement, and other general characteristics of the freight traffic of this country. One of the possible outcomes of an intensive survey of this kind may well be to arrive at conclusions as to what traffics could best be handled by rail, and what portion and kind of the whole movement of freight could better be left to other forms of transport. Dr. Beeching's preoccupation, obviously, must be with railway freight movement, but in doing so it is not unlikely that the result may be the formation of a planned transport system for the country as a whole.

Brigadier W. G. Tyrrell

BRIGADIER W. G. TYRRELL, whose death occurred last week, had a long association with Longmoor Camp, the transportation centre of the Royal Engineers, which has been attended by many railway officers. After holding a number of positions there, he was recalled from retirement on the outbreak of war in 1939 as Commandant, and he held that appointment until 1941. During the 1914-18 war he served on the Palestine front, where he was in charge of military railways and was responsible for the construction and operation of the military line from Kantara across the Sinai desert into Palestine. During his period as Assistant Director of Transportation at the War Office, an appointment he took up in November, 1933, he played a large part in the arrangements for the organisation and training of the units of the Transportation Supplementary Reserve, and as such became a familiar figure to many British Railways personnel. Brigadier Tyrrell never lost his interest in transportation units and he regularly attended the annual dinner of former R.O.D. officers, which until recently took place at the Transportation Club in London.

Development of railway property

ONE of the matters which has been causing concern to the British Transport Commission for some time has been the difficulty of getting the full benefit from the development of its considerable property holdings. A company has been set up by the Commission with the object of accelerating development of this kind. It will hold a minority interest in development companies in partnership with commercial developers. This should enable certain statutory restrictions which inhibit the Commission to be overcome. The chairman of the new company has not been announced, but Mr. Roy Matthews, chair-

man of Crosse & Blackwell (Holding) Limited has been appointed Deputy Chairman. Mr. Matthews is a member of the Southern Area Board and of the Property Committee of the Commission. His appointment is in no way connected with the recently-named new members of the British Transport Commission itself. The appointment has been made by the Commission and not by the Minister, and, to that extent, the new development is a domestic expansion of the Commission's activities.

F.B.I. panel to aid exporters

THE Federation of British Industries is taking a very active part in endeavours to promote overseas sales of British products. It realises that many smaller manufacturers are unfamiliar with export problems, and to help them the North Midland Regional Council of the F.B.I. has organised a panel of members well-versed in export technique. These members are prepared to give practical and personal help to novice exporters within the same industry or type of industry. The local Chambers of Commerce, the National Union of Manufacturers and four local hosiery manufacturers' associations have pledged support for the panel which consists of 14 members. These cover the principal industries in the North Midlands, including engineering, furniture, plastics, leather, and a number of branches of the textile industry. In the engineering industry in particular there must be a great number of smaller undertakings which could benefit from knowledge of export problems and techniques. In previous issues stress has been laid on the possibilities of developing sales of a wide range of products to railways overseas.

Railway Benevolent Institution

THE annual report and accounts of the Railway Benevolent Institution to the year ended April 30 last showed an overall deficit of £17,286 compared with a surplus for the previous year of £549. This deficit was caused mainly by the discontinuance of the separate casualty fund collection as part of a new campaign to increase general membership of the Institution. It is expected that a considerably larger amount will appear under the heading of subscriptions from members in the current year's account. The number of subscribing members which stood at 6,233 a year earlier was increased to no less than 77,405 by April 30 last. Payments in receipt of annuities amounted to £75,700 compared with £78,503 in 1960 and at the close of the financial year there were 1,104 widows and 485 members receiving assistance, a total of 1,589 against 1,700 the year before.

Trans-Zambesia Railway Co. Ltd.

THE Chairman of the Trans-Zambesia Railway Co. Ltd., Mr. Vivian L. Oury, has proved justified in his forecast that the operating results for 1960 would show improvement. The net receipts were referred to in our news pages last week. Operating receipts of the railway were £1,193,793, an increase of £85,803 or 7·7 per cent over those for 1959. Expenditure, including provision for renewals, was £897,562 (75·19 per cent of gross receipts) which compared with £824,311 (74·40 per cent), an increase of only £73,251. Net receipts increased £12,552 or 4·4 per cent. Renewal of fixed assets was £86,526 against £84,919, and the general reserve has been increased to £204,780 by transferring £31,394 from the reserve for increased cost of replacement of fixed assets. This represents the element of increased cost in expenditure in replacing some fixed assets. Goods traffic was a record at 895,785 tons—106,591 tons or 13 per cent over the previous year. Goods revenue increased by £88,039 (9 per cent) to £968,937. Passengers declined by 4,358 to 181,100 and revenue from this source was slightly down at £108,068.

Collision at Royton

IT IS not often that a train runs through the back of a terminal station, across the street outside and into the houses on the far side, but this happened at Royton, Lancashire, last February. The line into this station descends steeply at gradients of 1 in 62 and 1 in 71, and the driver lost control of his train, and failed to regain it. In his report, summarised on a later page, Colonel J. R. H. Robertson found the driver solely to blame. It was difficult to say where the driver first went wrong, but he apparently formed the opinion, unsupported by a subsequent examination of the wheels and track, that the wheels had locked and the whole train had got into a prolonged skid. He made the cardinal error of applying power to the wheels in a mistaken attempt to release them. Enquiries showed some divergence of opinion among the drivers in this link as to the proper speed at which to approach this station. It has therefore been decided to impose a special restriction of 30 m.p.h. as from an obvious land mark some 700 yards in the rear.

Strengthening the Assam Rail Link

THE severe damage in successive years sustained by the Assam Rail Link section of the Indian North-East Frontier Railway—resulting from its location along the foot of the Himalayan outer ranges—has now, it is to be hoped, been finally repaired, and repetition of the damage is unlikely, at any rate on the same scale. The estimated cost of the repairs is about £4,500,000 and the works entailed have included over two miles of bridging with spans of from 40 ft. to 150 ft., as well as 128 spans of 20 ft. and under. The policy adopted was not to fight the numerous rivers crossed, but to tame them by increasing the waterways and depths of foundations of some 42 bridges. Costly training works to keep the rivers to the required courses through the bridging were undertaken. The major bridging consisted in aggregate of 24 spans of 150 ft., 31 of 100 ft., 34 of 60 ft. and 54 spans of 40 ft.; 32 of them are on well-foundations.

Work study on British Railways

THE second issue of *Project*, a periodical brought out by the Work Study Organisation of the British Transport Commission, quotes the Chairman of the Commission, Dr. Richard Beeching, as having observed that British railwaymen must become anxious to earn more so that they can be paid more; that the finding of ways to make this possible is a responsibility of management, but that quick introduction of new methods depends on co-operation between management and men based on recognition of common interest. It notes that the application of work study by Imperial Chemical Industries Limited, within which group Dr. Beeching was a Director before his present appointment and from which he was seconded to the Commission, saved £4½ million in one year, and it would therefore seem clear that Dr. Beeching is in favour of it. According to the latest issue of *Project*, work study covers the development of human relations in industry and the design of tools, machinery, and furniture as well as its more obvious aspect of cutting out unnecessary movements.

Successful results to date

COMMENTING on the necessity to obtain viability for British Railways, Mr. E. J. Larkin, Director of Work Study, stated in *Project* No. 2 that two points stood out in this respect. These were that working costs must be reduced and services to traders and the public improved. Losses on the present scale clearly could not continue. Work study investigations, now covering over 40,000 railway staff, had shown that when working the staff was very close to "standard" performance, but because of operational and organisational problems there were in most cases extensive periods when there was no work

available. The same applied to the usage of capital assets, and work study had been demonstrated over and over again as one of the most effective means of showing where and how usage could be improved. Outstandingly successful applications of work study were described in the publication: these included the solution of a maintenance staff problem at Crewe (involving complicated questions of redundancy and training) and the effecting of improved freight handling at Manchester London Road. The latter application is of particular interest, for it was recommended by the staff concerned. Other successful applications have been carried out at Reading, Slough, and Brislington (Bristol).

C.T.C. in Rhodesia

FORMING part of Rhodesia Railways £5-million scheme for the installation of centralised traffic control on the main line from Umtali to Ndola—a distance of some 1,250 miles—the first major C.T.C. installation in Northern Rhodesia came into operation on August 9. The latest extension involved nine sidings on 42 miles of track from Natebe to Zimba. The intervening 8½ miles from Livingstone to Natebe are double track and equipped with automatic colourlight signals. C.T.C. will have been extended from Zimba to Kalomo within two or three months, and the Livingstone control panel will then be fully operative, directing main-line train movements from Thomson Junction (Wankie) to Kalomo a distance of 162 miles, excluding the double track immediately north of Livingstone. Other work includes intensified installation of the Broken Hill-Ndola section, and the opening of C.T.C. on the 45-mile line between Salisbury and Marandellas in Southern Rhodesia. This will be extended onward to Headlands before the end of the year, by which time the 41-mile stretch between Gwelo and Que Que also should have C.T.C., bringing total mileage so equipped to 683.

Pakistan's first railway budget

THE first separate budget for the railways of Pakistan—as explained in an editorial note in our issue of July 21 last—was presented on June 27 by Mr. F. M. Khan, Minister of Railways & Communications. It is for the financial year ending June 30, 1962, and the revised estimates quoted refer to the year 1960-61. It may also be useful to remember that the Pakistan Second Five-Year Plan is for the years July 1, 1960, to June 30, 1965. The total sum allocated for capital expenditure during that period is Rs.140 crores (£105 million).

The 1961-62 budget estimates revenue receipts at Rs.70·61 crores and revenue expenditure at Rs.61·12, so that there should be a surplus of Rs.9·49 crores. A sum of Rs.7·24 crores will be payable as interest to Pakistan general revenues, leaving a net surplus of Rs.2·25 crores (£1·69 million). Contributions from this are estimated at Rs.1·5 crores to the Railways Reserve Fund and Rs.0·75 crores to the Improvement Fund.

The revenue receipts were expected to total Rs.66·17 crores in the 1960-61 budget, but were able to be raised to Rs.67·28 crores in the revised estimates and, in place of an estimated profit of Rs.11·80 crores, the revised figure stands at Rs.12·29 crores.

The sum allocated for capital outlay during 1961-62 is Rs.34·6 crores as compared with Rs.20·37 crores shown in the 1960-61 revised estimates, or nearly Rs.14 crores higher. As the total allocation for the Second Five-year Plan period, 1960-65, is Rs.140 crores, and with the first year's (1960-61) allocation of Rs.20·80 crores underspent by 0·43 crores—due mainly to non-availability of materials—and the 1961-62 allocation of Rs.34·60 crores, nearly Rs.55 crores are available for the first two years of the period, leaving Rs.85 crores for the last three years.

Distribution of the 1961-62 Rs.34·60-crore allocation includes Rs.2·02 crores for new constructions, Rs.18·95 crores for rolling-stock, Rs.11·85 crores for improvements and other items, and Rs.0·59 crores for passenger amenities and staff welfare.

Farthest north in Canada

EARLY in July a Bill was before the Canadian House of Commons to approve and subsidise the proposed railway in extension of the Canadian National system to Great Slave Lake in the far north of the Dominion and within 400 miles of the Arctic Circle. Mr. Balcer, the Transport Minister, told the House that the line would tap one of the world's largest lead-zinc deposits at Pine Point near Hay River on Great Slave Lake. However, the main objective in building the line was, he said, to open up the country, which would appear from the map to be in the middle Peace River and Hay River basins, as well round the lake.

The Bill proposed a £31-million subsidy to the C.N.R. administration to enable it to construct the line. Though not yet finally located it will be about 400 miles in length. The alignment branches northwards from Grimshaw, the first station west of Peace River bridge and station on the C.N.R. branch from McLennan junction—on the Edmonton-Dawson Creek line—to Hines Creek. The northern terminus will be at the Northwest Territories port of Hay River on the southern shore of Great Slave Lake. From Hay River a 40-mile spur will be built to Pine Point, the area being developed by the Consolidated Mining & Smelting Company of Canada. According to Mr. Balcer, the new railway will encourage other mining ventures and the forestry and fishing industries, as well as providing a link with northern defence establishments.

The final location survey is at present being carried out by Canadian National Railway engineers and is expected to be completed in the autumn. The construction should take about four years and will also be the responsibility of C.N.R. engineers.

Centre couplers in Europe

AN important subject occupying the attention of Western European railways today is that of centre couplers. The strength of the feeling of member administrations of the U.I.C. that eventually all stock might have to be so fitted led to the subject being remitted last year to O.R.E. On the base of a technical specification drawn up by the Special U.I.C. Commission for Centre Couplers, and containing 35 requirements, O.R.E. invited preliminary designs and quotations from manufacturers. Nearly 100 companies received the invitation to submit technical proposals for solving the problem and, at the end of 1960, offers had been received from 13 different makers or groups of makers, including offers from the U.S.A. and one from Japan. All these offers are now being studied by O.R.E. and, though it seems unlikely that any single proposal can meet fully all 35 requirements, some probably will comply very closely. Already, the conditions which led to the requirements have in at least one case become modified, in that designs had to be suitable for connection to the U.S.S.R. model SA3 coupler, but that equipment itself is in course of modification. Automatic couplers must come to play an important part in the rationalisation of general traffic operation, particularly as the countries in Western Europe can begin with the very latest developments without any restrictions arising from old equipment. In yards alone, considerable savings in man-power and time, and enhanced safety, will be gained by the use of automatic centre couplers taking traction and buffing and housing also the air-brake connections. Moreover, coupler strength, and so possible train weights, will be increased. The U.I.C. now has enough information for reasonable capital-investment and economic-return studies to be made, and for a general appreciation of the technical procedure of change-over. But whatever the technical solution, the major questions are still whether it will prove practicable and economic to make the conversion, and whether arrangements can be made to permit

a very rapid change-over, as was done in Japan, without a lengthy and awkward transition stage. These are problems which need the deepest consideration of the U.I.C., and which should also come before the Conference of European Transport Ministers.

Western Region winter timetable

IN our June 2 issue we gave a preview of the even-interval timetable which is to be brought into operation by the Western Region on September 12. This described the general arrangement of the new services, and it only now remains to direct attention to some of the outstanding features of a timetable which is of unusual interest. For the public the main purpose of the changes is to give evenly-spaced travel facilities throughout the day, and, even at the expense of increasing the overall times of certain prestige expresses, which at present are inadequately patronised, to improve the service to and from important intermediate stations; from the operating point of view the changes obtain better employment of motive power and coaching stock.

In general, faster running will be called for only on the main lines from Paddington to Plymouth and Bristol, as these are the only two which, for the present, can depend entirely on diesel haulage of passenger trains. With the benefits of rapid diesel acceleration, it has proved possible to maintain and even to improve average overall times; for example, the average journey time from Paddington to Torquay will be cut by 13min. and in the reverse direction by 25 min., and this will be coupled with an increase in the number of trains from five Down and six Up each day to seven in each direction, exactly spaced at 2 hr. intervals. Taunton, an important traffic centre for the West Country and a major beneficiary by the new arrangements, has its average journey time from and to London reduced by no less than 33 and 28 min. respectively. As a measure of the increased speed of running, the Western Region winter timetable contains some 40 runs booked at over 60 m.p.h. from start to stop, chiefly over the Plymouth and Bristol main lines.

Apart from the Great Eastern Line of the Eastern Region, and the electrified Southern Region lines, no other British timetable will have so completely systematised a service in the Up direction as well as the Down. A striking example of this may be seen on the Worcester line, on which throughout the day the departures for Paddington will be at precisely even 2-hr. intervals from Hereford, Ledbury, Colwall, Malvern, Malvern Link, Worcester, Evesham, Moreton-in-Marsh, and Kingham. Over this line, still with steam haulage, Worcester and stations west will certainly suffer an appreciable deceleration of service by reason of the increased number of stops, but this is justified in some measure at least by the traffic brought to the line by radiating bus services at places like Kingham and Moreton-in-Marsh.

By the concentration of all the Bristol services on the Bath route, with Bath stops in all cases (the " Bristolian " included), there will be departures from Paddington to both Bath and Bristol at every hour from 7.45 a.m. to 7.45 p.m., from Bristol to Paddington hourly from 7.15 a.m. to 6.15 p.m. and from Bath each hour from 7.32 a.m. to 7.32 p.m. inclusive. From Chippenham, the departures for London will be generally at 54 min. past the hr., though not in this case at every hour during the day; the average time from London will be cut by 11 min. and to London by 9 min., and in view of the industrial importance of this town the midday " Bristol Pullman " services will call here in each direction.

Reading is another town of steadily increasing importance, especially in view of the traffic fed into and out of long-distance trains by the Paddington-Reading diesel service. It will now have three direct departures to the West of England, five to Bristol (with two more by connection at Didcot), and five to South Wales (with one more *via* Didcot), and similarly in the reverse direction. The Didcot stops of several expresses, with non-stop runs between there and Paddington, will confer various benefits apart from the Reading connections just mentioned; they will provide additional fast services by connection between Oxford and both Paddington and the West of England, while Didcot also is a traffic centre for the surrounding area, including Harwell.

A feature of the new timetable which should appeal to business executives is the possibility now given of making earlier starts, with breakfast if desired on the train, and thus of reaching distant points in time to transact business before lunch. To the West of England, for example, the 8.30 a.m. (former 9.30) from Paddington will reach Taunton at 11.6 and Exeter at 11.41 a.m. The " Inter-City," at 8.20 instead of 9 a.m. from London, will be in Birmingham by 10.34 and Wolverhampton by 10.59 a.m. In the Up direction the 6.40 a.m. " South Wales Pullman " from Swansea (7.50 a.m. from Cardiff) will bring its passengers into Paddington at 10.15 a.m., 40 min. earlier than the former " Capitals United."

Apart from the altered times of the " South Wales Pullman " (Up in the morning and Down in the evening instead of the opposite procedure) and of the midday " Birmingham Pullman " workings, there is to be relatively little change as yet on these two routes, on which all trains other than the Pullmans will still be steam-operated. But the intention is to concentrate the 2,700 h.p. Co-Co diesels now under construction at Swindon first on the Birmingham line, so making possible the restoration of 2 hr. timings with present loads between Paddington and Snow Hill. When sufficient of the new units are available, their next assignment will be the West of England line, and 4 hr. timings between Paddington and Plymouth, intermediate stops included, and the " Bristolian's " 1¾ hr. between Paddington and Bristol should once again become practicable, with other improvements. The displaced 2,200 h.p. units will then be available for accelerating the South Wales trains, and for closing the gaps to provide an hourly service throughout the day over this route also. The Western Region winter timetable thus represents the first stage in what is to be a continuing process of train service improvement, and reflects credit on all those who have been concerned in its compilation.

B.T.C. and British Railways Board

THE appointments to the British Transport Commission announced last week are an indication of the shape of the British Railways Board which will replace the Commission some time next year. Dr. Richard Beeching, Chairman of the Commission, has selected men, two of them from outside industry and one from within the ranks of the British Transport Commission, who, there can be no doubt, will be his principal lieutenants in his efforts to perform the task laid on him by the Government of reorganising the railways and bringing them back to solvency.

The impending retirement of Sir John Benstead as Deputy Chairman of the British Transport Commission has made a suitable place vacant for Sir Philip Warter, who is at present a part-time member of the Commission and Chairman of the Southern Area Board. Sir Philip Warter has held the latter position for six years and during that time has devoted himself wholeheartedly to the well-being of that section of the railways as well as giving generously of his time to the wider problems which have faced the Commission as a whole. Despite the calls on his time as Chairman of the Associated British Picture Corporation, of which he will continue to act as Chairman, and which, in itself, has shown the progress which has stemmed from a progressive and lively head, Sir Philip Warter has played a very considerable part in the development of policy on the Southern Area Board. Indeed, " part-time " to many would be a misnomer for the amount of the attention which he has paid to the affairs of his railway and of the Commission. He is a man of progressive outlook and of very broad administrative ability. Both the Minister of Transport and Dr. Beeching have put on record that they have no doubt that his duties with

the Associated British Picture Corporation will in no way affect his ability fully to discharge his responsibilities of Deputy Chairman of the Commission. Of that his record with the Southern Region can leave no doubt. Possibly at some future time he may relinquish the Chairmanship of the Southern Area Board, but for the time being, at least, he is expected to retain that appointment in addition to the Deputy Chairmanship.

Dr. Beeching is recruiting two men from outside industry, which is in conformity with the proposals of the White Paper on the reorganisation of the nationalised transport undertakings which was issued last December, and also with the statements made by the Minister of Transport during debates which ensued. It is clear that in making these appointments, which no doubt have been on the recommendation of Dr. Beeching, full cognisance has been given to acquaintance with, and participation in, the administration of large-scale industrial enterprises.

Mr. P. H. Shirley, who will become a full-time member of the Commission on October 1, is at present Chairman of Batchelors Foods Limited, one of the subsidiary companies of the Unilever Group. He is being seconded to the British Transport Commission by Unilever Limited and is to have special responsibility for finance.

Mr. L. H. Williams, who becomes a full-time member of the Commission on September 1, has spent most of his career with Shell and until recently was Managing Director of the Shell Chemical Co. Ltd., from which position he retired last year and began a special study for the head of Shell's international chemical operations until his retirement from the company in June of this year. Mr. Williams will have special responsibility for commercial affairs on the British Transport Commission.

With these new appointments Dr. Beeching may well feel that he has the nucleus of membership of the British Railways Board which must soon begin to exist as a shadow entity until it is given statutory form when the new transport legislation is passed by Parliament next year. Undoubtedly, there will be further additions to that body, but these may well be made from within the present personnel of the Commission. The new members of the British Transport Commission raise the number of appointments to that body from 14 to 15 which is the maximum permitted under the 1953 Transport Act. It would seem likely, therefore, that at any rate for the time being, the new appointments which have been long-expected have been made, and that from now onwards work on the British Railways Board will take place within the confines of the Commission itself. It would hardly seem worthwhile to seek a new Act, however brief, to enable the Commission to extend the number of its members for the purpose of peopling a shadow board.

Some comment has been made in the daily press on the salaries which are to be paid the new members of the Commission. Sir Philip Warter, who is 57 years old, will receive £6,000 a year as Deputy Chairman. This will be £2,000 less than the salary of Sir John Benstead who is full-time Deputy Chairman and who retires on October 1. Mr. Shirley, who is 48, will receive £12,000 a year which places him in the same financial position as he enjoys under his present employment. This is the principle which was applied to Dr. Beeching when he moved from Imperial Chemical Industries to the British Transport Commission. Mr. Williams, who is 52, will receive £7,500 a year, the salary normally paid to full-time Commission members and presumably will be in addition to what is no doubt a substantial pension receivable from Shell.

Suggestions that any of these sums are excessive at the present time when the Chancellor of the Exchequer has asked for a "salary and wage pause" have little relevance, because there can be no doubt that negotiations for these appointments were commenced and probably had reached a practical conclusion before the Chancellor made his appeal. In any event, if Dr. Beeching is to be given a reasonable chance of fulfilling the enormously heavy task which has been placed on him, he must be able to recruit the men who in his estimation are best fitted to fulfil his requirements. There can be no question of competition for jobs of this kind. On the contrary, the difficulty must necessarily arise of being able to attract the right kind of executive on terms which are considered reasonable to both parties, and in our view, at least, the payments which have been announced cannot be deemed excessive.

As might have been expected, the reaction of the railway trade union officials was that the principle of higher salaries should be followed "right down the line." In so far as the basic principle is concerned, this is not an unreasonable suggestion, but it must be accompanied by the qualification that higher pay in every case should be based on a careful scrutiny of the quality of the person in the job with which he is entrusted. This is a basic principle of private enterprise with which, no doubt, Dr. Beeching is fully aware. Higher pay for particularly selected and fully qualified individual personnel is frequently a measure of economy, far greater in its beneficial incidence than broad upward adjustment of rates of pay without regard to personal merit.

In our view, which has been frequently stated in these columns, there is a good case to be made for higher rates of remuneration for railway officers, not necessarily as a whole and not necessarily in broad swathes, but rather on the basis of individual merit and personal ability. This is a matter which is not without its difficulty in an organisation so large in numbers and so complex in structure as British Railways; but it is a matter which a person of Dr. Beeching's background and experience will have well in mind at a time when above all it is necessary to encourage initiative and improve the morale of railway officers generally.

The U.S.A. railway position

BY A CORRESPONDENT

THE setback to the U.S.A. railways during the early months of 1961 was recorded in the *Railway Gazette* of July 21. Their position was not strengthened appreciably in May. Operating revenues for five months totalled $3,622·2 million against $4,065·5 million in 1960, a decrease of nearly 11 per cent. Operating expenses were reduced by 6·6 per cent to $2,983 million, but the operating ratio rose from 78·6 per cent to 82·35. Despite a 13 per cent fall in taxes of all kinds, net railway operating income of $86·6 million was little more than a third of the 1960 amount of $273·5 million. Net income, after charges, was estimated at $17 million compared with $195 million last year.

At the end of May about 25 railways were in deficit. The New York Central was $20·1 million short and the Pennsylvania nearly $15 million, while the New Haven, operating at a ration of 100 per cent, was bankrupt—close on $11 million to the bad. At the other end of the scale the Norfolk & Western, working at a ratio of 59 per cent, had the highest earnings of any railway in the States, $23 million. Several railways, including the Burlington, Illinois Central and Gulf, Mobile & Ohio managed to cut expenditure enough to leave them better off, but there were no signs of an all-round betterment in freight traffic during the second half of the year. In the first half 2,098,030 fewer wagons were loaded than in 1960, a decrease of 13 per cent and 2,676,630 fewer than in 1959, a drop of 16 per cent. These losses were spread over all classes of traffic and a rise of 10,370 in the number of flat wagons loaded with road trailers was an insignificant set off.

Since 1930 all railways have lost money in peacetime on their once profitable passenger business. By far the largest passenger carrier is the Pennsylvania. Last year it had the smallest loss since the war—$30·9 million. It held down its passenger service operating ratio to 106 per cent, but may have difficulty in reducing it further. Plans for dealing with commuter travel, which does not pay, are being considered but it is too early to judge whether any of these schemes will solve what has become an awkward social problem.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

RAILWAYS INTO ROADS

August 4

SIR, I have read with interest the correspondence relating to the conversion of railways into roads, and it occurs to me that several factors have not been taken into account.

Perfect weather at all times appears to be assumed. It is hard to imagine greater chaos than would occur during thick fog or icy conditions on these converted roads, with dense traffic trying to travel at high speed nose to tail. I realise that weather affects railways also, but to a lesser extent. The block system assures safety as far as is humanly possible and, with the extension of colour-light signalling and A.W.S., delays through bad weather conditions should be negligible.

Sooner or later the roads will need repair. With railways it is possible to bring tools and material to the site during slack periods and deposit them in the "sixfoot" with perfect safety, and a great deal of preliminary work can be done without affecting the running of the trains. What would be the effect of road repairs? Even if of a minor nature they would possibly cut down the carrying capacity by a half to three-quarters.

Thirdly, tunnels and viaducts are glossed over. I believe it was found impracticable to convert the tramway tunnel under Kingsway to road traffic. Ignoring the fact that numerous tunnels are single bore, I am wondering what sort of conditions would develop in, say, Primrose Hill or Watford Tunnels or on Welwyn Viaduct under pressure.

Yours faithfully,

M. H. SMITH

86, Wanlip Road,
Syston, Leicester

HIGH-PERFORMANCE LIGHTWEIGHT TRAINS

August 15

SIR, Mr. Durrant in his letter published in your issue of July 21, says that my article entitled "High-performance lightweight trains" makes a comparison "obviously chosen to give the impression that a diesel is 'superior' to an electric train in performance."

This was certainly not the intention of the article; Mr. Durrant has been misled by the fact that only the diesel version of the lightweight set appears in Fig. 2. The electric version could not be included because no suitable power equipment is yet available in this country, whereas in the case of the diesel, the particular design of engine and transmission shown in Fig. 3 has been available here for several years, and its actual performance is well known.

An electric version with a continuous rating of at least 1,500 h.p. would obviously improve on the diesel's performance, provided that the power equipment had a considerably better power: weight ratio than the present a.c. equipment, the various types of which have continuous ratings varying from 770 to 830 h.p., and weigh between 19.2 and 23.5 tons. Because of the law of diminishing returns, the resulting reduction in schedule times would be surprisingly small.

The 830-h.p. and 152-ton electric is not "fictitious;" both conventional types in Fig. 2 are standard designs which have been described in *The Railway Gazette* and built in large numbers. The speed curve and times shown for the a.c. electric set are not based solely on the continuous rating as Mr. Durrant appears to believe, but include the short-term rating during acceleration.

Mr. Durrant cites the case of a diesel railcar being "stuck" in an unsuitable gear ratio when ascending a particular gradient. This is a fault inherent with a mechanical drive having only four speeds; it can be remedied either by fitting a gearbox with more speeds, or by employing a hydraulic drive, as in Fig. 3. The particular type shown permits both engine and rail h.p. to remain virtually constant; it may be noted that recent developments should further improve the transmission efficiency and road performance.

The table of costs does not involve the lightweight set in a 923-day year. The figures of 110 and 130 miles a day are the distances covered by one crew in the conventional and lightweight sets respectively.

The writer does not wish errors to remain uncorrected and would be grateful if Mr. Durrant would give details of the other "howlers" to which he referred.

Here it is opportune to rectify a mistake on page 709, where the first paragraph states that the rail h.p. of a diesel can be as much as 22 per cent less than the engine rating. The figure should be 32 per cent.

Yours faithfully,

YOUR CONTRIBUTOR

London, S.W.1

UNREALISTIC RATES AND FARES

August 5

SIR, Are we creating a period when we shall recall our present extensive sytem of rail services with the realisation that they imparted an essential factor to such grace and peace of life that remained? Shall we then see that they were slowly ruined by a fare and charges policy which was completely justified by accountancy, but which took little account of the ideas and thoughts of the masses of people, and gave great encouragement and opportunity to rivals and competitors.

Railways are widely studied in all ways save perhaps in their effects on the quality of the national life they have done so much to create and in the midst of which they operate. Can a highly developed community demote its railway system without weakening its experience of civilised values?

The root of the trouble seems to be that the fares policy is so little appreciated by the general public which is ready to give credence to the idea that supporting railways is reactionary. The truth is that greater progress divides, say, a Trans-Pennine diesel train from William Hedley's "Wylam Dilly" than does that similarly separating a motor coach and Gurney's road steam carriage. Railways have matured into the texture of life as much as they have into the landscape. Herein lies the root of a most sincere publicity and an arresting criticism of either the fares policy or the failure to explain it properly.

There is a place for all forms of transport, but the penalty for allowing the railways to be eroded could be acute in the destruction of serenity and physical injury. The busiest railway can pass through the heart of a close, built-up area with the minimum of disturbance to residents or strain to their nerves. Few things would bring greater enthusiasm to those who have the well-being of our railways at heart than the general recognition of these truths and the prospect of a really competitive scale of fares and charges, or to hear the last of the pessimism apparent in conversation with railway friends, that charges are killing and not creating business, and the frequent remark at holiday times: "we would have preferred to go by train but we couldn't afford it." The last remark is heard less frequently since the introduction of 15-day holiday returns in the West Riding, at really competitive prices.

Yours faithfully,

WILLIAM B. STOCKS

22, Heatherfield Road,
Marsh, Huddersfield

The Scrap Heap

Conversion

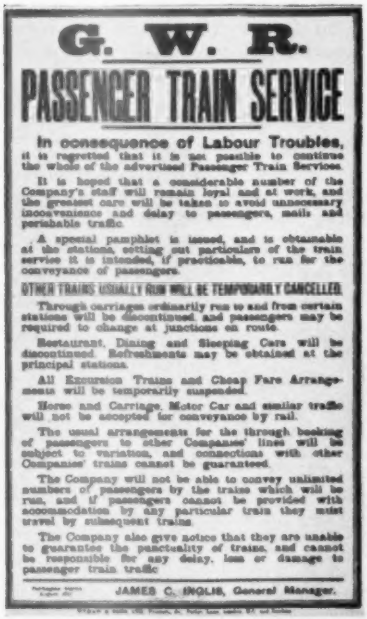
Gloucester County Council has leased Barber's Bridge, an old railway station in the country to the north-west of the city of Gloucester, to be converted into a youth centre. The covered platform has been fenced off from the line along which two trains still run. When the alterations have been completed and the booking office has become a dormitory and the waiting-room a dining-room, it will be available to any group of young people in the county, whether or not they are members of an organised club, provided that they can find a "responsible adult" to be with them.—*Condensed from "The Guardian."*

Double-edged

Recently the Public Relations Department of the South African Railways received a telephone call from a young girl who was obliged to pass a street adjoining a railway depot every day on her way to work, and was embarrassed by the attentions of the railway employees. She asked that some action be taken to restrain their demonstrations of admiration. When asked whether she were not accustomed to men admiring her figure, she replied: "Many passes are made at me, but the railwaymen, and I know them by their uniforms, are carrying the matter a bit too far. Besides, they do not look very intelligent types to me." To conclude the conversation, the Public Relations Officer remarked that it would never have occurred to him if he had been a pretty girl, that an admirer, however humble, had a poor mentality.—*Condensed from "The South African Railway News."*

The railway strike of 1911

The most extensive paralysis of British transport up to that time occurred in August, 1911, as a result of widespread labour unrest, culminating in a national railway strike. It began with a stoppage at the London Docks which threatened food supplies and caused three-quarters of the London bus services to be suspended for lack of petrol. Railwaymen were then involved at Liverpool and Manchester, and a widespread strike appeared imminent. The Government offered to place at the service of the railway companies "every available soldier in the country." This was solely to protect property and maintain public order, but the action was widely interpreted otherwise. A general railway strike began on August 18. The military were called out to guard focal points, such as signalboxes, locomotive depots, tunnels, and main-line stations. The full-dress headgear worn by the Guards, with khaki field uniform, caused the soldiers to suffer considerably in the 100 deg. in the shade of an exceptionally hot summer.


G. W. R.

PASSENGER TRAIN SERVICE

In consequence of Labour Troubles, it is regretted that it is not possible to continue the whole of the advertised Passenger Train Services.

It is hoped that a considerable number of the Company's staff will remain loyal and at work, and the greatest care will be taken to avoid unnecessary inconvenience and delay to passengers, mails and perishable traffic.

A special pamphlet is issued, and is obtainable at the stations, setting out particulars of the train service it is intended, if practicable, to run for the conveyance of passengers.

OTHER TRAINS USUALLY RUN WILL BE TEMPORARILY CANCELLED.

Through carriages ordinarily run to and from certain stations will be discontinued, and passengers may be required to change at junctions en route.

Restaurant, Dining and Sleeping Cars will be discontinued. Refreshments may be obtained at the principal stations.

All Excursion Trains and Cheap Fare Arrangements will be temporarily suspended.

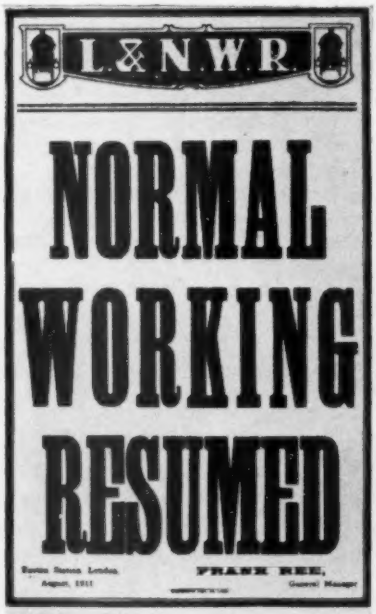
Horse and Carriage, Motor Car and similar traffic will not be accepted for conveyance by rail.

The usual arrangements for the through booking of passengers to other Companies' lines will be subject to variation, and connections with other Companies' trains cannot be guaranteed.

The Company will not be able to convey unlimited numbers of passengers by the trains which will be run, and if passengers cannot be provided with accommodation by any particular train they must travel by subsequent trains.

The Company also give notice that they are unable to guarantee the punctuality of trains, and cannot be responsible for any delay, loss or damage to passenger train traffic.

JAMES C. INGLIS, General Manager.


L. & N.W.R.

NORMAL WORKING RESUMED

Euston Station, London.
August, 1911.

FRANK REE,
General Manager.

Posters published in connection with the railway strike of 1911

Stamps issued by Communist (top) and Nationalist (bottom) Chinese authorities

A compromise was reached on August 19, at a meeting held under the auspices of the President of the Board of Trade, and a Royal Commission was appointed. The outcome was generally regarded as a victory for the trade unions, and Mr. Lloyd George said that the Government had effected a settlement of "one of the most menacing industrial strikes with which this country had ever been confronted."

Commemoration stamps

The birth centenary of Chan Tien-Yu, the Chinese railway engineer responsible for the construction in 1905-09 of the Peking - Chingchiakou railway linking North China with inner Mongolia, has been celebrated by the issue of pairs of special stamps in both Communist and Nationalist China. The Peking-Chingchiakou railway was the first Chinese-built line, and its construction involved crossing the high mountains between Peking and the Nankow Pass in the Great Wall. Chan Tien-Yu studied engineering in the United States. He was the founder of the Chinese Institute of Engineers.

Delayed action

Basque saboteurs attempted to derail on July 18 a train taking veterans of the Spanish civil war from the 25th anniversary celebrations at San Sebastian of the launching of the insurrection in 1936. Fishplates were loosened as well as other bolts and screws on the track but the attempt failed. This information was contained in a statement by the Minister of the Interior more than a month after the incident occurred.

OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

INDIA

Madras Central Station remodelling

On April 11 the Chief Minister of Madras opened the remodelled Madras Central Station. It now has 11 platforms accommodating trains of from 13 to 17 bogie coaches. The approaches also have been greatly improved enabling trains to run into the station without the previous delays.

Flyovers for Eastern Railway

A vitally important work was completed on February 15, when the eastern flyover at Moghalsarai—the most important junction and marshalling yard—was brought into use. It eliminates the crossing on the level of Grand Chord and main-line traffic. Its construction involved the building of 11 bridges and the movement of 13 million cu. ft. of earth. Another flyover on the Eastern Railway at Andal was opened on February 5 to carry Durgapur traffic over the marshalling yard there.

NEW ZEALAND

Wellington-Picton ferry vessel

Work is progressing satisfactorily on the Wellington-Picton ferry vessel in William Denny & Bros. Ltd.'s yards at Dumbarton, Scotland. It is reported that fabrication of watertight bulkheads and hull panels is well advanced, and assembly on the slipway of prefabricated units is in hand. It is expected that the vessel will be ready for launching in late September or October of this year.

Artist's impression of the "Bullet Express" leaving Tokyo

JAPAN

"Bullet Express" trains

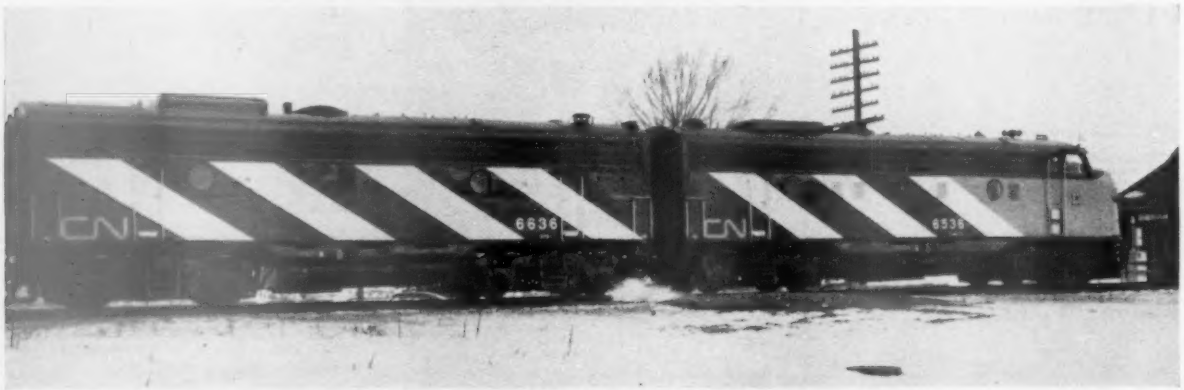
The National Railway Corporation of Japan has announced that "Bullet" trains will be running before the Tokyo Olympics in 1964, on 4-ft. 8½-in. gauge lines in Japan. These trains will run at a maximum speed of 155 m.p.h. Power output will be 680 kW. a coach or 8·16 kW. for a 12-coach train. Because of this high speed the braking system will be an electronic control device flashing a speed-indicating radio wave into the track to regulate the speed of the train automatically. These trains will be fireproof and dustproof.

UNITED STATES

C. & O.-B. & O. pre-merger affiliation

The hearings on the Chesapeake & Ohio Railway administration's application for affiliation—as a step towards future merger—with the Baltimore & Ohio Railroad began on June 19 before the Interstate Commerce Commission in Washington.

DIESEL LOCOMOTIVE ON THE CANADIAN NATIONAL RAILWAYS



Diesel-electric locomotive showing distinctive colour design and C.N. symbol

TURKEY AND IRAN CONNECTED by rail

Railway, under construction from Ankara and Teheran, nearing completion

THE construction of a little-known but important international rail link between Turkey and Iran (Persia) is progressing step by step, and when work on the sections now in hand is finished only 158 miles and a ferry will remain to connect Ankara with Teheran, the capital cities, probably 1,800-2,000 miles of track.

Future importance

In the more distant future, its importance will lie in the fact that it will form part of the Europe-Pakistan-India rail route when the line to connect Zahidan—the Pakistan Western Railway terminus in Eastern Iran—with the Iranian State Railways system has been completed.

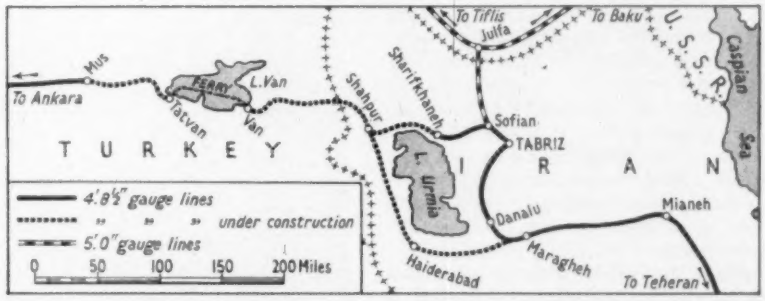
Construction is proceeding from both ends. At the Turkish end the line from Ankara eastwards towards the Iranian frontier was completed as far as Mus in 1955. A further 61 miles onwards from Mus to Tatvan, on the shore of Lake Van, is at present under construction.

At the Iranian end of this future international link, the previous terminus of the Government Railways system at Mianeh was connected with Tabriz in 1958 and with the Tabriz-Azerbaijan 5 ft. (Russian) gauge railway; the Mianeh-Tabriz 4 ft. 8½ in. gauge extension is 189 miles in length. Subsequently 52 miles of the broad-gauge line from Tabriz to Sharifkhaneh have been converted to standard gauge, and work is at present in hand on a new length of construction from Sharifkhaneh towards the Turko-Iranian frontier at or near Qutur.

Standards of construction

Under the auspices of the International Co-operation Administration the Chicago firm of consulting engineers, Messrs. De Leuw, Cather & Company carried out an engineering, traffic, and economic survey of the whole route in 1958. They recommended a ruling gradient of 1 in 67 and a maximum curvature of about 15 ch. Subsequently, for its part, the Turkish Ministry of Public Works has decided to provide for a maximum of about 27-ch. curvature—presumably only applicable to the Turkish section, which is understood to be not quite so difficult as the Iranian.

Other standards of construction adopted include 18 inches of ballast depth, hardwood sleepers, 93½ lb. rails and 20-ft. formation on embankments and 27-ft. in cuttings. Bridges and culverts are of either stone masonry or reinforced concrete according to the materials and labour available. Tunnels are being lined with stone masonry.



Proposed route of rail link

On the Turkish Mus-Tatvan construction-formation level varies from 4,200 to 5,900 ft. altitude. Four tunnels are being constructed, the longest being 3,600 ft.; the estimated quantity of excavation is 4,600,000 cu. yd. and the longest bridge is 105 ft.

Survey results

It was found from the surveys that to carry the line round either the north or south side of Lake Van would cost either £25 or £32½ million respectively. Accordingly it was decided to resort to a ferry along the lake from Tatvan to Van, a distance of 56 miles. Including two 1,000-ton ferry vessels, quay facilities and a dry dock this is estimated to cost only about £7 million.

Eastwards from Van, altitude 5,412 ft., the line will rise to a 7,183-ft. summit before it descends into the Qutur valley to reach the frontier, 74 miles from Van. On this section six tunnels with an aggregate length of 6,670 ft. will be necessary and 4·1 million cu. yd. of excavation are estimated as required.

On the other hand, the Iranian engineers are faced with an 84-mile length of construction from Sharifkhaneh, on Lake Urmia (or Rejaiyeh), to the frontier, considered the most formidable of the whole project. The preliminary survey shows that some 27 tunnels with an aggregate length of 16,400 ft. will be required. Moreover, it will not be possible to adhere to a 1 in 67 maximum gradient here. Instead 8·7 miles of 1 in 36 are recommended against westbound traffic in the Qutur gorge and pusher or assistant motive power will be necessary. Further surveys are proceeding and it is hoped that at any rate the tunnelling may be reduced, and also that the gradient may be eased.

Construction plant and labour

Construction methods in the two countries vary considerably. On the Turkish section excavation, fill, and tunnelling are highly mechanised. During the limited working season, from March to November, from 60 to 80 units of plant are in use and about 3,500 men are employed on shifts aggregating 22 hours a day. The section under construction is expected to be completed in 1962. In Iran little heavy equipment is available, and all outdoor earthwork is being done by a labour force over 800 strong.

Politics, economy, and traffic

It is noteworthy that the completion of this through route is being urged by the Central Treaty Organisation, formerly the Baghdad Pact group, but funds are not being made available either by loan or foreign exchange as freely as it had been hoped. Uncertainty regarding the economic justification of the undertaking is the main reason for this hesitation, but local currency allocations by Turkey and Iran are stated to have doubled credits so far advanced by the United States and Great Britain. Meanwhile progress appears to be unfettered and satisfactory. It is pointed out that at present freight from Western Europe to Teheran has to go by sea *via* the Suez Canal, Arabian Sea and Persian Gulf to Khorranshar and thence by rail. To reach some parts of Iran takes up to six months. By the proposed railway it should take three weeks or less.

IRON-ORE RAILWAY and port—II

Construction of harbour at Port Cartier entails excavation through solid rock to depth of 50 ft.

THE north-west shore of the Gulf of St. Lawrence is exposed to south-east gales and there are no natural harbours available for hundreds of miles on either side of Shelter Bay, the nearest point on the coast to the Lac Jeannine ore deposits. The choice therefore lay between building an artificial harbour or a much longer line of railway to a more hospitable coast, with natural protection for a harbour. A longer line would have been not only more costly to construct but also to work, and would have sent up the cost of transporting every ton of ore concentrate.

It was decided to construct a harbour at Port Cartier even though this entailed excavation to 50-ft. depth in solid rock to provide berthing and turning facilities for the largest ore ships contemplated.

Main features of the port

Its main features are a basin measuring 2,500 ft. in length and 450 ft. wide with a comparatively narrow entrance channel from the Gulf, protected by breakwaters extending into open water. The berthing is designed for 100,000-ton ore ships, though the largest at present afloat is of 60,000-ton capacity. Two berths have been constructed, but there will eventually be four. The whole basin will have a minimum depth of 50 ft. of water at low tide.

Part of 15-mile long canyon which includes five tunnels

Lowering rail into place

The basin was excavated in the dry as a pond before the entrance channel was similarly hewn out of the rocky shore. The more difficult part of the work was the construction of the entrance channel. This required extensive cofferdams of the circular cell type of two kinds. One was first used temporarily for excavation and de-watering but was retained as part of the foundations of the breakwaters. The other was used as part of temporary breakwaters to enclose the outer part of the channel. A battery of powerful pumps was engaged in the de-watering, the most difficult problem involved apart from the excavation of 7 million cu. yd. of solid rock.

The final job was the removal by excavation of the rock-plug to connect the berthing and turning basin with the approach channel, and the demolition of the temporary cofferdams and breakwaters. The permanent breakwaters have 1-in-4 slopes to combat wave-action.

Handling facilities at the new port are modern in the extreme with a maximum of automation. The locomotives of each ore train arriving from Lac Jeannine, usually comprising 125 wagons of 93-ton capacity, spot it precisely at a dumper before proceeding to shed. A system of massive hydraulic rams then pushes the whole train forward a wagon-length at a time on to the rotary dumper. To enable each wagon in turn to be dumped without uncoupling, a special type of swivel coupling is used. In this way 45 wagons, carrying about 4,000 long-tons of ore, can be dumped in an hour entirely automatically.

Ore flow

The ore then goes through a vibrator and lump-breaker, passes on a conveyor-belt, and is carried either to a ship-loader or to an ore-storage shed. Ore can be withdrawn from the shed for ship-loading instead of going directly from a train. To allow cessation of flow of ore to the ship-loader, when changing holds necessi-

Excavation of rock wall near Little Lac Manicouagan

tates a pause, the conveyor system has a 1,000-ton capacity surge bin; the wagon-dumping and conveyor meanwhile can thus carry on for a few minutes without interruption. Ship-loading is at a rate of about 5,000 tons an hour.

The storage shed is 900 ft. long, 210 ft. wide, and 90 ft. high and will hold 400,000 long tons of ore. It is built of high-strength steel alloy and has a braced two-hinged arch framework supporting the roof and main crane runways. All equipment is of most modern types, including that in the locomotive- and wagon-repair depots.

Port yard and diesel shop

In the port area there are some 12½ miles of sidings and 33 turnouts; a circular loop is included enabling complete trains to be turned. A diesel locomotive shop contains a four-unit fuelling, servicing and inspection bay separated from the main shop by a fireproof wall. In winter, heat from the shop can be cut off from the bay so that servicing can be carried out without condensation in the electrical equipment arising from sudden changes in temperature.

The shop has a two-unit heavy-repair track and a 350-ft. bogie-release track; it is served by a 30-ton gantry crane. There is also a wheel shop and a three-track 21-spot covered wagon shop.

Locomotive stock consists of 17 four-motor diesel-electrics rated at 1,750-1,800 h.p. They are equipped with the new 26 L-type air-brake, dead-man control, watchman heaters against frost, and composition brake shoes.

The wagons resemble those of the Quebec, North Shore & Labrador Railway, except that they have no clasp brakes. They have composition shoes of such a high co-efficient of friction that only a single-shoe brake is required with them, even on these 100-ton-capacity wagons on the heavy gradients.

The wagons are of high-tensile low-alloy steel and have Timken roller bearings. One end of each wagon is fitted with a rotary coupler enabling dumping to be effected while coupled. The tare weight is only 23 tons, made possible by reduced body-weight resulting from the fact that the concentrate carried behaves like sand; the lack of clasp-brakes also makes for lightness.

Five hundred of these ore wagons and 165 general service wagons are in service. There are two breakdown cranes, one of 250-ton and the other of 150-ton capacity. Other locomotive cranes and mechanical equipment are provided for mechanised track maintenance. All locomotives are fitted with detachable snowploughs.

Operating details

Each train leaving Lac Jeannine every 11 hr., carrying 12,500 tons of concentrate and weighing nearly 16,000 tons, is hauled by four diesel units; the time taken to Port Cartier is under 9 hr.

Container or piggyback working is in service for general traffic, and thrice-weekly mixed trains carry passengers. C.T.C. is installed to facilitate dispatching, and radio transmission to locomotives from the terminals and from train to train provides continuous communications.

TRANSCONTINENTAL FAST GOODS SERVICE

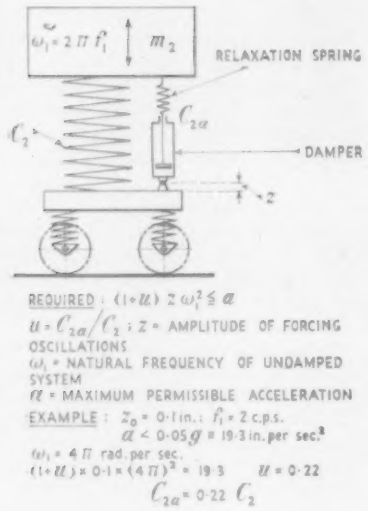
The Canadian Pacific Railway has inaugurated a transcontinental express freight service between Toronto and Vancouver. Known as "The Day Saver" this train covers the 2,704 miles in 82 hr. 20 min.

One of the seventeen trestle bridges carrying the railway

CARRIAGE AND RAILCAR BOGIES
their design and development—IV

Design factors considered in this part include brake ratios; axle fatigue ; adhesion, and P/D

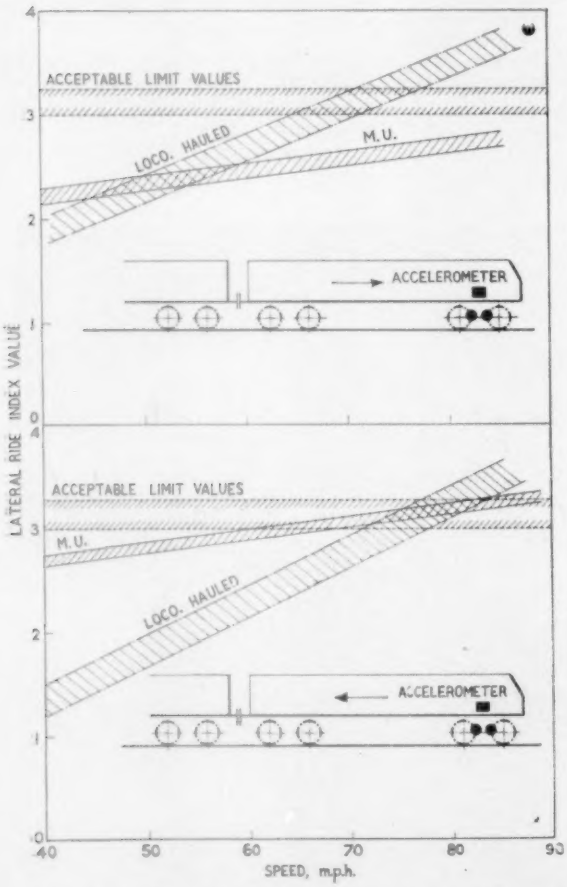
By J. L. KOFFMAN, *Design Engineer, (Projects), Chief Mechanical Engineer's Department, British Railways Central Staff*

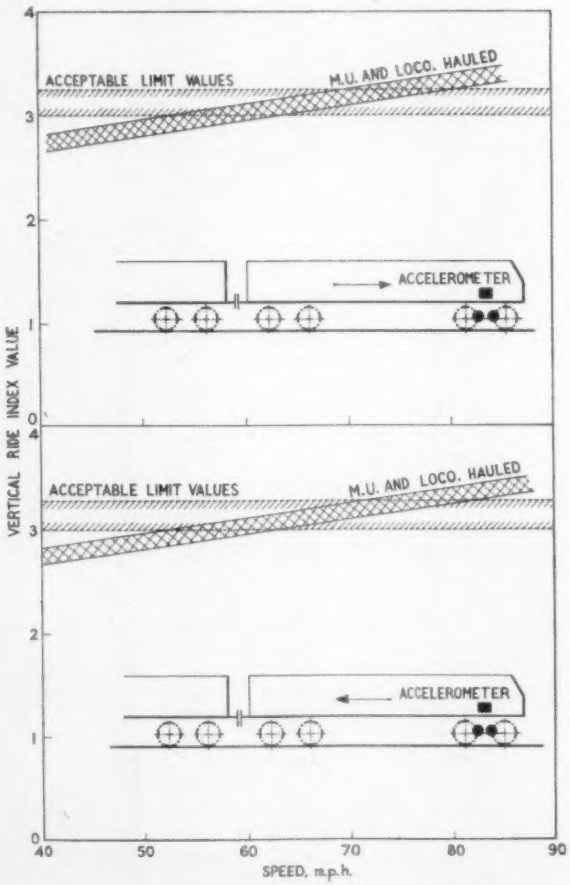

$\omega_1 = 2\pi f_1$
m_2
RELAXATION SPRING
C_{2a}
C_2
DAMPER
z
REQUIRED : $(1+u)\, z\, \omega_1^2 \leq a$
$u = C_{2a}/C_2$; z = AMPLITUDE OF FORCING OSCILLATIONS
ω_1 = NATURAL FREQUENCY OF UNDAMPED SYSTEM
a = MAXIMUM PERMISSIBLE ACCELERATION
EXAMPLE : $z_0 = 0{\cdot}1$ in. ; $f_1 = 2$ c.p.s.
$a < 0{\cdot}05\,g = 19{\cdot}3$ in. per sec.^{2}
$\omega_1 = 4\pi$ rad. per sec.
$(1+u) \times 0{\cdot}1 \times (4\pi)^2 = 19{\cdot}3$ $u = 0{\cdot}22$
$C_{2a} = 0{\cdot}22\ C_2$

FIGS. 1, 2, and 3 in this part of the article were referred to in Part III (published on pages 538 to 542 inclusive of our May 12, 1961 issue). The references occurred on pages 541 and 542 under figure numbers 3, 4, and 5 respectively.

To attain the values referred to in the table and last paragraph of Part III of this article, it will be advisable to make use of modern axlebox guide designs, eliminating hornguides in favour of positive location and permitting in-line arrangement of frames above axleboxes and bolster suspension directly below the frame, as exemplified by many modern designs. In this manner, torsional stresses imposed on the bogie frame are kept to a minimum, while general load distribution is also conducive to lower bending stresses. One has only to compare the frame of the S.I.G. bogie with the more conventional product to appreciate the simplicity and elegance of the former.

Fabricated box sections made from pressings are frequently used for frames





(Top): fig. 1—Relaxation spring in series with vertical damper can improve vehicle riding. (Bottom): fig. 2—Ride index values of multiple-unit train

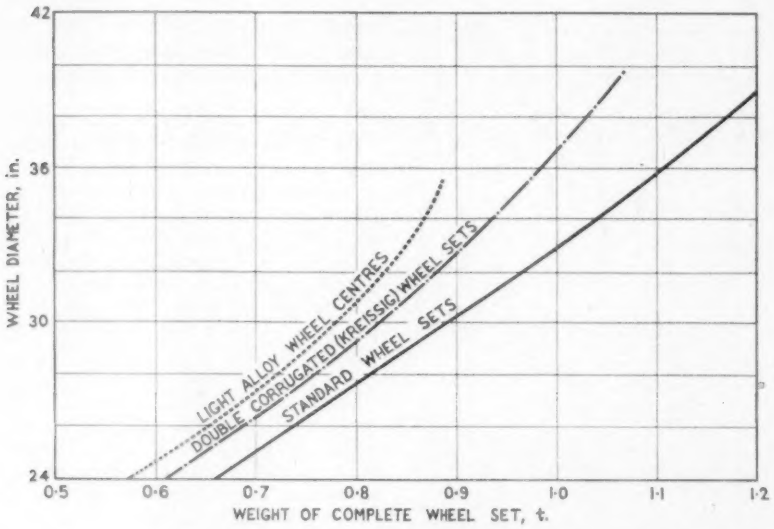


Fig. 3—The effect of wheel diameter and design on weight

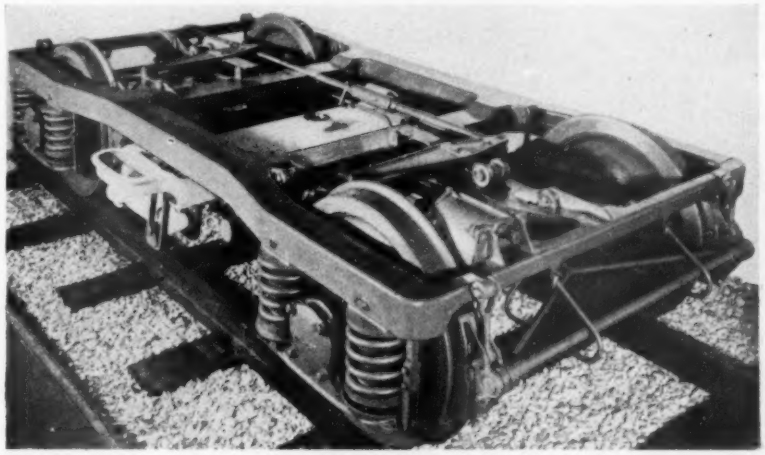
of this type, but here the use of rolled sections as successfully employed by P. Pringiers with the Belgian Class "123" Bo-Bo locomotives may be cited as worthy of consideration. Careful frame stressing is essential if weight is to be kept down, particularly with frames of novel design where it might not be prudent to employ Meineke's simple formula in accordance with which frame-plate thickness of steam locomotives is $(13 + Q + 0{\cdot}2P)$ mm., where Q[t] = wheel load, and P[t] = piston force. This formula is stated also to be applicable for other than steam locomotives (P = 0).

Braking

Faster services also demand more effective braking. This in turn will require brake ratios which, with modern coaching stock are in the order of 1 : 1·5 of the tare weight, on occasions increasing even up to 2·2. These values must be cut back to about 0·8 at speeds below about 30 m.p.h. The use of double brake-blocks, each about 10 in. long, also should be considered when applying conventional systems to high-speed bogies.

The practice of unequal brake block pressure for the sake of cheaper brake rigging should never be tolerated. The lower first costs are soon wiped out by heavier maintenance expenses resulting from more frequent attention to brake blocks and axle guides.

The dependence of braking distance on deceleration for constant values of retardation of 1·5 to 5 ft. per sec.^{2} is plotted in fig. 4. No allowance was made for the time-lag between brake application and actual action at the wheels. The brake performance of representative train formations is also indicated in fig. 4. The use of magnetic track brakes as an emergency feature is gaining favour with high-speed railcar trains and with some recent diesel locomotives. The use of pneumatic track brakes might also be considered here. Powerful brakes will increase the stresses imposed on the bogie frame and complicate the layout, for quite a few members are needed solely to carry the brake rigging. In fact, the end cross-members often are provided mainly for this function. Nevertheless, introduction of disc brakes is likely to facilitate simplification of frame design.



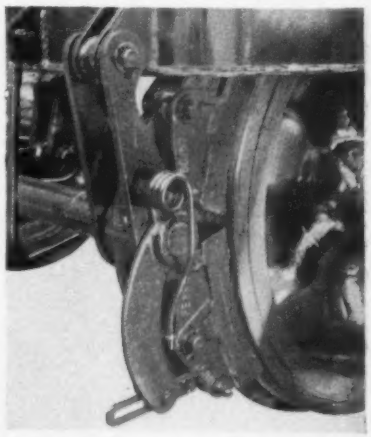
Attractively simple layout of S.I.G. bogie frame achieved by careful attention to stress distribution and desire to keep weight low

Axles

The determination of axle parameters has not always made use of up-to-date information in the field of fatigue stress considerations. This is particularly surprising in view of the fact that Wöhler's work on axle fatigue was the origin of the present vast field of endeavour. The subject was considered at some length in the May, 1950, issue of *Diesel Railway Traction*, and it is becoming clear that a routine method of calculation set out in well-defined steps on a pre-printed form indicating the influence of such design variables as fillet radii, type of vehicle, speeds, whether four-wheeler or bogie, and so on, relating to dynamic load allowance and other factors is long overdue.

Adhesion

With light-power vehicles, tractive effort is generally limited solely by adhesion at speeds of up to about 50 m.p.h. Because of this, every effort is made to raise adhesion limits as far as possible, particularly at starting and at lower speeds. This means that weight transfer must be kept low, and this in turn requires that the bogie should be linked to the body at a low level. Here it is important to ensure that the inevitable bogie pitching will not cause high stress peaks at the kingpin or cause intense shuttle of the body.



High speeds demand improved braking incorporating clasp brakes with double blocks

The tractive effort characteristics deserve special attention. The steeper the

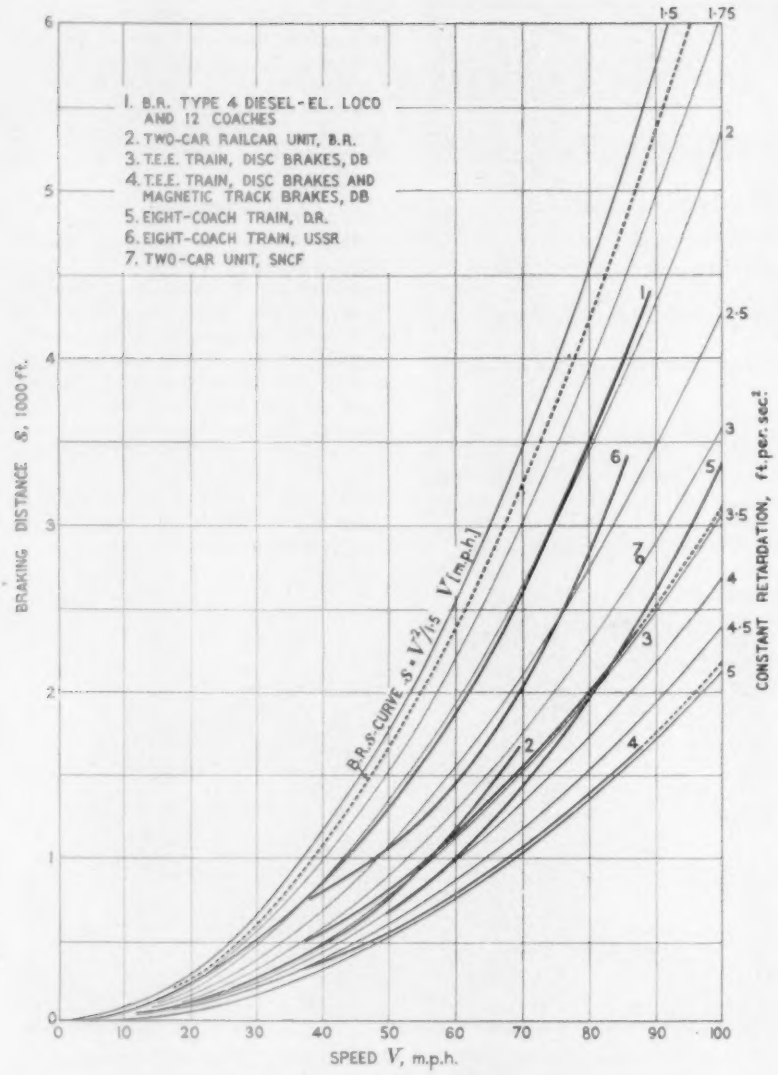

1. B.R. TYPE 4 DIESEL-EL. LOCO AND 12 COACHES
2. TWO-CAR RAILCAR UNIT, B.R.
3. T.E.E. TRAIN, DISC BRAKES, DB
4. T.E.E. TRAIN, DISC BRAKES AND MAGNETIC TRACK BRAKES, DB
5. EIGHT-COACH TRAIN, D.R.
6. EIGHT-COACH TRAIN, USSR
7. TWO-CAR UNIT, SNCF
B.R.S. CURVE $S = V^2/15$ V (m.p.h.)
BRAKING DISTANCE S, 1000 ft.
CONSTANT RETARDATION, ft. per. sec.²
SPEED V, m.p.h.
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5 6
1·5 1·75 2 2·5 3 3·5 4 4·5 5

Fig. 4—Brake performance of modern passenger stock

tractive effort (ordinate) versus speed (abscissa) at the higher speeds, the less are the wheels likely to spin at reduced adhesion values, or, conversely, the more closely is it possible to operate at the limits set by adhesion. Here, much has been achieved with the parallel connected motors of modern a.c. 50 cycles per sec. vehicles. Somewhat similar results can also be attained with other electric traction systems as well as with diesel-electric and diesel-hydraulic railcars and locomotives, provided that the necessary attention is paid in matching tractive effort characteristics to railway requirements.

The effect of the suspension dynamics and the action of drives on the ability to maintain high tractive effort and prevent wheel spin so far has not received due attention. Bogie and body oscillations can alter axle-loads to an extent likely to affect tractive effort by causing wheel-spinning, particularly at lower speeds. It is in this sphere that research would be particularly welcome in providing guidance for future design.

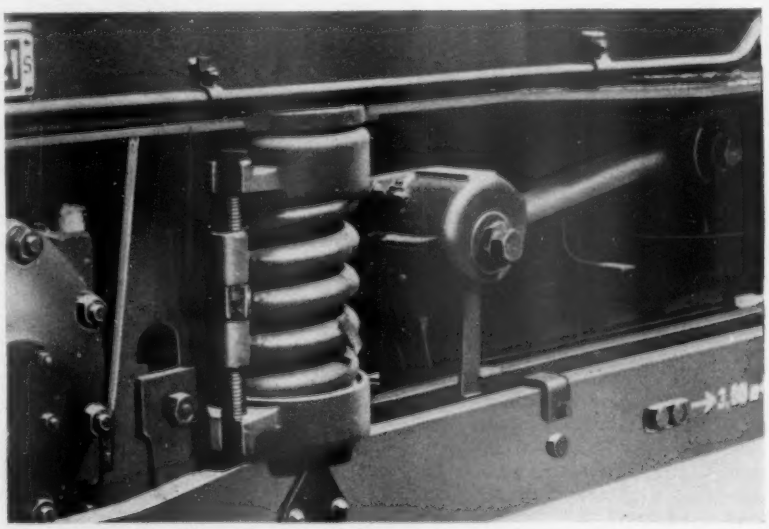
P/D

Consideration based on an appreciation of the magnitude of stresses at point of contact between wheel and rail as worked out with the aid of equations due to H. Hertz have suggested to some railway civil engineers that the value of P[t] divided by wheel diameter D [ft.] should not exceed the value of 5. It was considered that exceeding this value might lead to rail shelling and to excessive track maintenance expenses.

Such limits are mainly arrived at as the result of calculations relating to new wheels and rails, while a slight alteration of tyre profile or railhead radius is likely to reduce appreciably the theoretical stresses. Furthermore, no allowance is usually made for various statistical aspects such as the number of heavy *versus* light axles, speed, unsprung mass, for the fact that not all wheels are likely to run over precisely the same point on the railhead and that, depending on rate of wear, cold-rolling of the rail by the wheels would have a mitigating effect.

Quite apart from the fact that, within the confines of the loading gauge, the resultant rather large wheel diameters are likely to hamper design, the above limit also inadvertently encouraged poor design. As the question of suitable suspension characteristics was not considered, it was only necessary to use suitably large wheels which, in conjunction with poor suspension and through their increased unsprung mass, could inflict heavy punishment on the frame, both in vertical and lateral plane where the large wheels at a necessarily-increased wheelbase would increase the moment of inertia about the Z—axis, this

Continued on page 220



Length, height, and attachment of traction rods merit careful attention

YARMOUTH (VAUXHALL) STATION, British Railways, Eastern Region,

Busy Great Eastern Line station completely remodelled with bright, spacious buildings

THE Eastern Region of British Railways has rebuilt Yarmouth (Vauxhall) Station on the Great Eastern Line.

Work on the reconstruction began towards the end of 1958: the first stage included the provision of an enlarged covered passenger concourse, temporary left-luggage and waiting-room facilities, the lengthening of two of the platforms, and improvements to assist train operation in the area. This part of the scheme was completed by the summer of 1959.

Exterior view showing canopy and ticket office

Second stage

The principal feature of the second, and most important stage, was the construction of the station buildings. These consisted, on the east side, of ticket, parcels, and inquiry offices, parcels-loading dock, bookstall, ladies' waiting room, toilets, left-luggage office, and accommodation for station and train staff. On the west side, bordering the main concourse was another block, accommodating the police and station-master's offices, gentlemen's toilets, and general waiting room.

The main entrance is now on the east side of the station and two additional entrances to the concourse have been provided for use during the summer peak period. An unusual feature is a movable barrier which can shut off part of the concourse area during the quiet winter months. High-level glazing on the east and west sides of the concourse, and what almost amounts to a " wall of glass " on the south aspect, make the fullest advantage of natural light.

The left luggage office has been enlarged and specially designed to deal with the heavy summer traffic. The ticket office, fully mechanised, adjoins a glass-fronted passenger-inquiry and seat-reservation office overlooking the station forecourt. Nearby, is the entrance to the parcels office and loading bay.

Ticket office seen from station interior

All the surfaces and fittings have been specially chosen for good appearance, durability, and easy maintenance. In the ladies' waiting room, two cubicles have been specially provided to meet the needs of nursing mothers. Finished in lacquered natural pine, the cubicles are equipped with bottle-warmers. The waiting room itself has a quarry-tile floor, white emulsion-painted ceiling, neutral-coloured glass-mosaic walls, and coloured plyglass windows. The walls of the toilet have dark-green tiles and constant hot water is also provided.

Floor coverings

The ticket office has linoleum floor-tiles, white emulsion-painted walls, mustard-colour ceiling, and olive doors. The walls of the general waiting room are covered in Italian glass-mosaic and here, as in the ladies' room the furniture has been specially designed for British Railways. Seats are of hardwood slats in makore—a very hard, close-grained timber of the mahogany family. It is finished in a hard, heat- and scratch-resisting lacquer. The frames of the furniture are of rigid steel, rust-proofed and stove enamelled.

All the windows in the station have white frames and black opening lights.

The extensive use of glass and natural timber used in the construction was intended to give a distinct "nautical" appearance.

The heating is mainly of the under-floor type with oil-fired central heating boilers.

The ticket office is equipped with a Flexiprinter machine which can issue both ordinary and season tickets, printing any one type at the rate of a hundred a minute. For this reason it has been adopted by the Eastern Region for medium- and smaller-sized ticket offices which have a heavy demand for a limited range of tickets.

Steel unit furniture

Modern steel unit furniture, which is now standard for all new or re-equipped offices in the Eastern Region, has been provided. The furniture is based on a module of 2 ft. and so has the advantage of wide adaptability.

The new forecourt has parking space for 22 cars and there are facilities for both buses and taxis. A road has been constructed along the riverside behind the nearby goods offices, so that goods vehicles can avoid the station forecourt—particularly important during periods of heavy passenger traffic. Refreshment facilities will be provided at the entrance to the station forecourt.

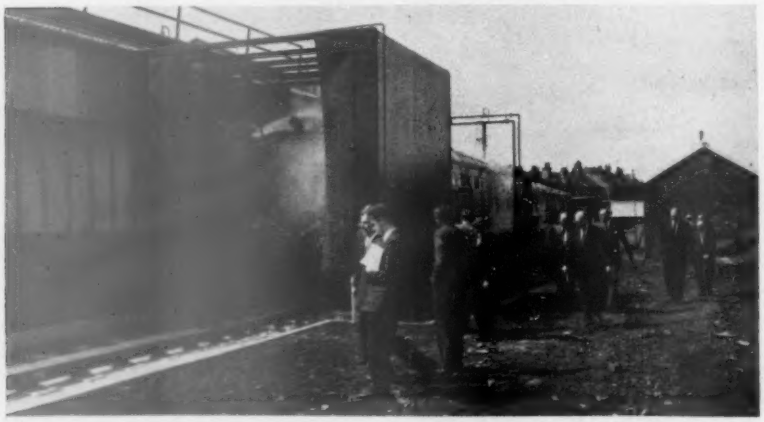
Ladies' waiting room with coloured plyglass windows

The remodelling of the station was undertaken by Mr. H. H. Powell, Architect, British Railways, Eastern Region, working under the direction of Mr. A. K. Terris, Chief Civil Engineer, Eastern Region. The building contractor was R. G. Carter Limited.

BRADFORD HAMMERTON STREET MOTIVE POWER DEPOT

(*see July 28 issue, pages* 115-116)

Fuelling a diesel multiple-unit at the fuelling siding



Diesel multiple-unit coaches passing through the carriage-washing machine

Carriage and railcar bogies—their design and development—IV

(*Concluded from page* 218)

possibly being responsible for corner shelling.

It is obvious that wheel diameters should not be reduced below certain sizes governed by considerations relating to contact stresses at the wheel as well as at the rail, thermal stresses due to braking clearances, and danger of derailment (particularly at crossings) but, at the same time, these limits should be allied to rational considerations relating to the suspension design which can do much to reduce the dynamic loads. In this connection, administrations with some experience in these matters do not seem to hesitate to employ locomotives capable of 90 m.p.h. with a P/D value of 21/3·44 = 6·1 and even 21/3·12 = 6·73, although here particular care was exercised to design an efficient suspension.

EASTERN REGION BEST KEPT GARDENS COMPETITION, 1961

The following six stations received special class awards:—*Great Eastern Line:* Aldeburgh, Cantley, Histon and Wolferton. *Great Northern Line:* Burgh-le-Marsh and Sandy. In addition 36 stations received First Class awards and 31 gained Second Class awards.

ELECTRIC RAILWAY TRACTION SECTION

L. T. & S. electrification

COMMENTING on the decision to introduce in the late autumn a limited number of electric trains on the London, Tilbury & Southend Line of the Eastern Region of British Railways, Mr. H. C. Johnson, General Manager of the Eastern Region, stated that difficulties over rolling-stock, labour, and supply of materials had made it impossible for the contractors to meet the date set out by the Eastern Region for the introduction of the full electric service with the winter timetable. The multiple-unit sets for this service had been delivered last year and had been running on the Liverpool Street line for some months. As a result of this running, some modifications had been necessary for the traction motors to secure the reliability and punctuality which were essential in a service of this kind. The manufacturer, The English Electric Co. Ltd., had drawn up an emergency programme to deal with these changes, but it had had to be accepted that it would take time to complete the modifications.

Because of this, the Eastern Region had decided, in the interests of its customers, to delay the introduction of the full new electric service until the modifications had been carried out and the rolling-stock could be accepted as reliable. In these circumstances it was considered that the interests of passengers would be best served by a more gradual introduction of the train sets which would be run in the existing steam timings alongside steam trains. On that basis it would be possible to introduce some electric trains before Christmas and to increase the numbers progressively. A date for the introduction of the full electric service could not at present be given, but the Eastern Region was doing everything in its power, with the collaboration of the manufacturer, to make it as early as possible.

Following Mr. Johnson's announcement, the English Electric Co. Ltd. stated that, as a result of running experience gained during the last year (both on the Fenchurch Street and Liverpool Street lines), although it had not been necessary to take trains out of service, it had been decided that some modifications were desirable to ensure complete reliabiity of the motors in service. It would not be necessary to disrupt the existing train services or to modify all the motors as those supplied more recently had proved entirely satisfactory. But to ensure reliability and a long service life, a priority programme was under way to modify those motors involved.

Electrification in Katanga

THE Compagnie du Chemin de Fer du Bas-Congo au Katanga (B.C.K.) is to electrify the Kolwezi-Mutshatsha section on the Lobito route. The distance from Kolwezi to Mutshatsha is 157 km. Of this, 8 kms. from Kolwezi to the Metalkat (Societe Metallurgique du Katanga) metallurgical plant, has already been completed. Power is obtained from the Union Minière du Haut-Katanga transmission network at 110,000 V. and is stepped down at the B.C.K. sub-station at Metalkat to 25,000 V. (a.c.). A substation will be built at Kayemba, 109 km. west of Metalkat. This substation will also be required when further electrification of the route to Dilolo takes place.

B.C.K. traction units operate on 25,000 V. 50-cycle single-phase alternating current. As the spacing of substations can be increased to about 80 km. and very much lighter catenaries (107 mm.-section cadmium-bronze alloy) and contact wires (84 mm.-section copper) can be used, considerable reduction in the cost of transmission installations and equipment is possible. An underground telephone cable must be laid as the inductance caused by the 25,000-V. a.c. line would result in interference on the existing line.

The B.C.K. will purchase and supply equipment and materials, and the erection of the steel masts, fixing of the catenary,

laying of the telephone cable, and so on will be done by contractors. Tenders have been called for. The cost is expected to be fr. 1 million per km., exclusive of the substation. This, plus a new transformer at the Metalkat substation, will cost fr. 30 million. Work started last May, and it is intended to commission the section during November, 1962.

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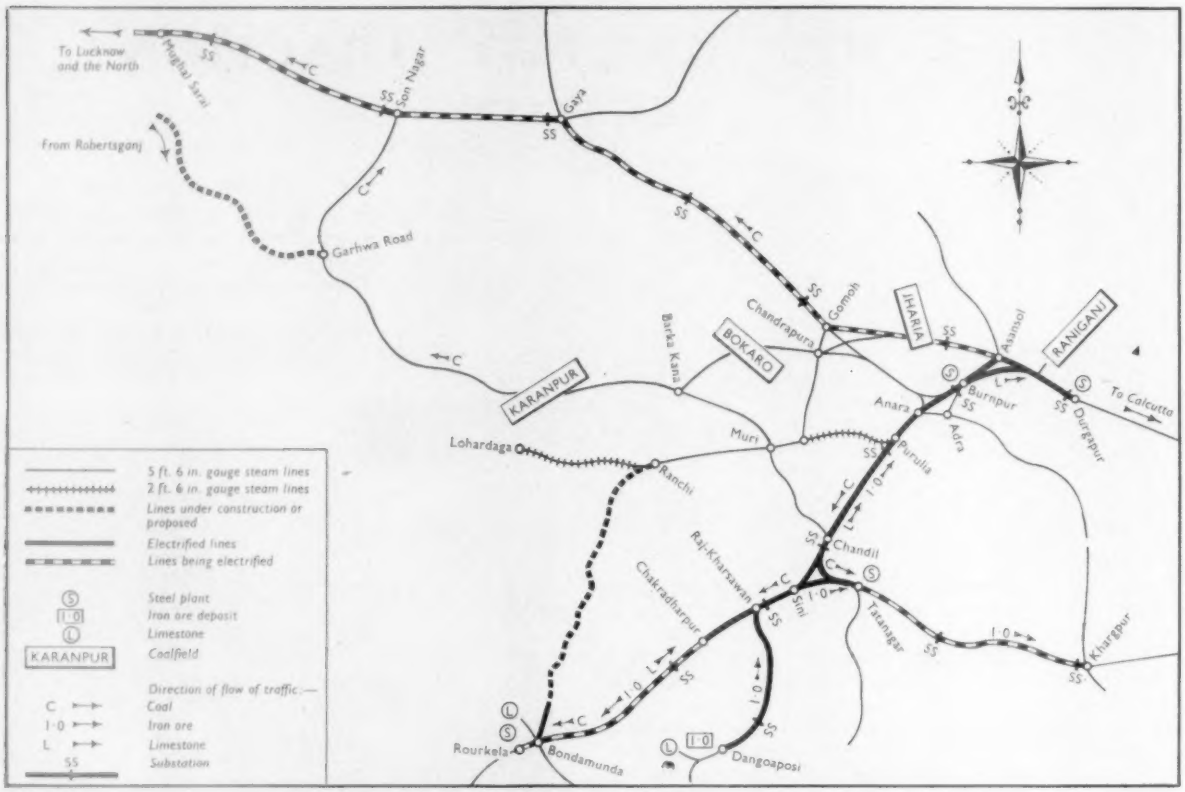


Map of 25 kV. electrification on South Eastern Railway of India

25-kV. ELECTRIFICATION on South Eastern Railway of India

185 route-miles of electrified line inaugurated on July 22, 1961

AS RECORDED in this week's overseas columns, the initial 185 route- and 425 track-miles of the South Eastern Railway were opened for the electric traction of freight traffic in July. In the absence through ill-health of the President of the Republic, the inaugural ceremony was performed by Mr. Karnail Singh, Chairman of the Railway Board.

The sections of line now electrified are Asansol-Sini, Rajkharsawan-Dangoaposi and Tatanagar-Chakradharpur. These are shown on the map, as well as those on the Eastern Railway being progressively opened for electric traction between Durgapur and Moghalrarai, a distance of about 310 route-miles.

Further electrification

On the South Eastern Railway, work is proceeding on the electrification of two further sections of the main line, Khargpur-Tatanajar and Chakradharpur-Rourkela, with a combined route-mileage of 140; it is hoped that these will be completed shortly when aggregate electrified route-mileage on the South-Eastern Railway will be 325. It is noteworthy that the whole of the 185 route-miles now electrified, with the exception of 10 miles, are double line.

Extent and system of electrification

For all the 600-odd route-miles electrified or being electrified on both railways, power is supplied at 25 kV. single-phase through the 15 132/25-kV. step-down substations shown on the map. On the S.E.R., five are already in use and three others will come into use with the Khargpur-Rourkela electrification in the near future; the other seven substations are on the Eastern Railway Durgapur-Moghalsarai electrification, about two-thirds of which is already complete. The five substations in service draw their current from the Damodar Valley electricity authority and the Bihar State Electricity Board.

Dealing now exclusively with electrification works on the South Eastern Railway, the overhead traction equipment includes galvanised steel masts with cantilever brackets supporting the overhead wiring, but in some yards gantry or portal structures are necessary. The masts are normally 30-ft. 6-in. rolled or fabricated steel sections embedded about 5 ft. in concrete blocks cast *in situ*, each roughly 3 ft. x 2 ft. 9 in. x 6 ft. deep. The bracket is a h.t. steel tube assembly with ferrous and non-ferrous fittings and solid-core insulators mostly imported. The galvanising is done at Chittaranjan works. The catenary consists of 19 strands of 1 per cent cadmium-copper 65 sq. mm. in sectional area. The contact wire is sus-

Continued on page 225

SIGNALLING ON THE DIJON-VALLORBE LINE of the S.N.C.F.

Developments in signalling, track improvement, and electric traction result in improved train operation

THE remarkable development in train operating practice that has taken place on the South Eastern Region of the French National Railways since the war has been the result of a co-ordinated programme of track improvement, a change from steam to electric traction, and far-reaching developments in signalling.

Re-signalling of main line

One of the earliest projects to attract attention was the re-signalling of the main line over certain stretches between Laroche and Dijon to permit running in each direction and the control of the signalling on these sections by C.T.C. This was in direct response of the traffic demands of the line, on which there is an extremely heavy flow of southbound traffic in the late evening, and a corresponding heavy flow in the northbound direction in the early hours of the morning. The new signalling arrangements permit, where necessary, both lines to be used at the same time for southbound traffic, and both lines to be used for northbound traffic at other times.

During the annual summer convention of the I.R.S.E., members were enabled to inspect a further extremely interesting C.T.C. installation on the international main line running south-east from Dijon to the Swiss Frontier at Vallorbe. At present, the complete project is not finished, but the work already done and the indications for the future are extremely interesting. This signalling has an added significance in that the traction system between Mouchard and Vallorbe is 50 cycles a.c. at 25,000 V.

Signal installation at Mouchard

The accompanying map shows the position of this line in relation to the French railway network as a whole. The section between Dijon and Mouchard is double track and has not yet been included in the C.T.C. scheme but, between Mouchard and Vallorbe, the line has been changed from double to single track, with certain lengthy passing loops.

Hump yard control cabin

Two C.T.C. systems

This section—some 60 miles long—is now C.T.C.-controlled and makes use of two varieties of C.T.C. First, between Frasne and Vallorbe, a coded control system working on the voice-range frequency-transmission principle is installed. It is of particular interest in that the control centre for this section is not in the section itself but sited at Mouchard. This again is only intended as a temporary control centre, the intention being to control the whole line from Dijon to Vallorbe from a control centre at Dijon itself. Secondly, the section between Mouchard and Frasne has been selected for a particularly interesting development of the remote-control principle, with all-electronic programming of the signalling of train movements. This latter is the first installation of its kind in Europe.

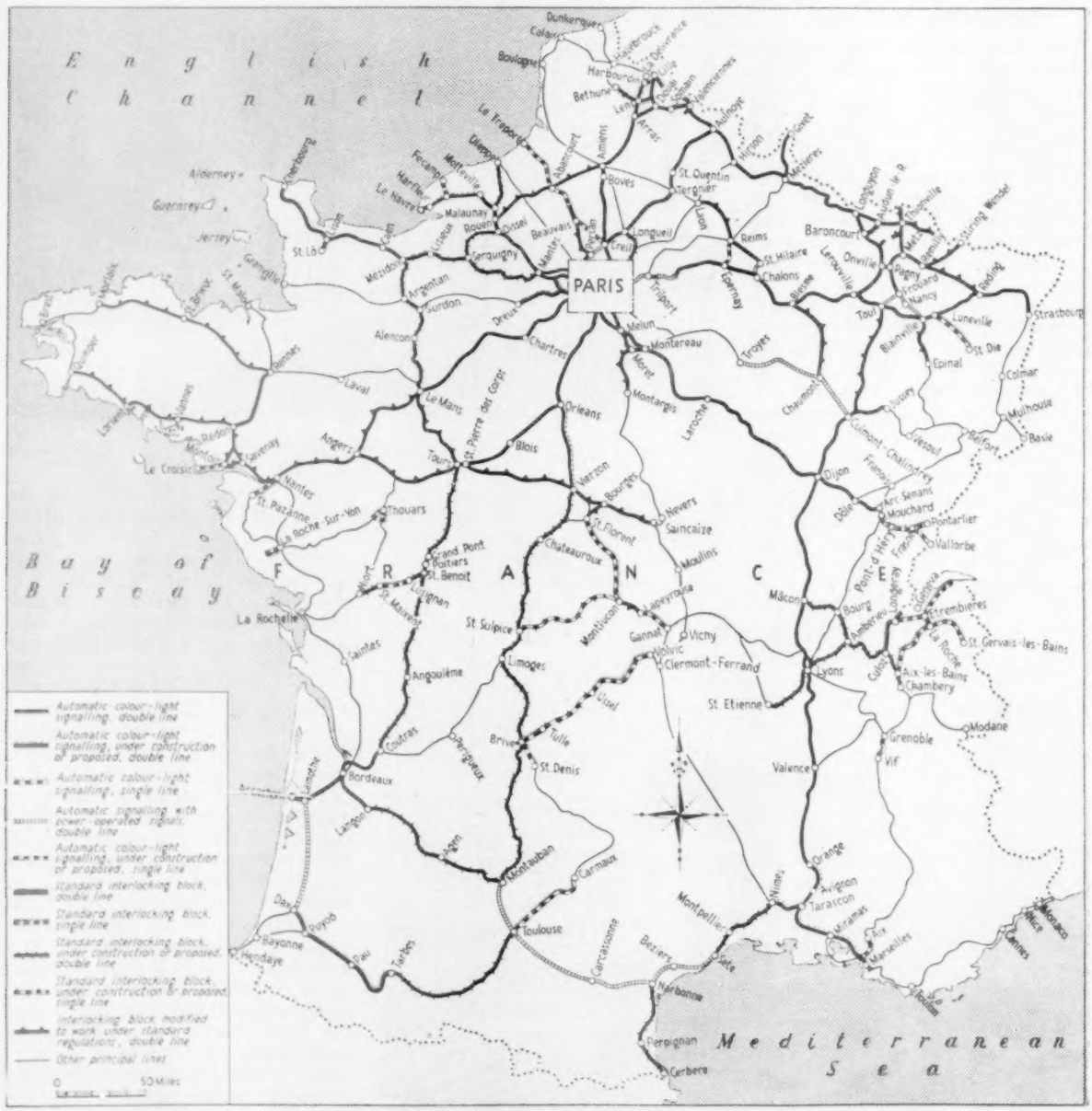
The C.T.C. system provides for the setting-up, by means of "flexible transit" relay units, of routes for all trains between Mouchard and Frasne. The programmer, which at present is located at Mouchard, enables the despatcher to set up complete routes through the section for as many as four trains. Controls necessary for the carrying-through of this programme are stored in the equipment and, as the trains progress along the line, those controls are released automatically to set up movements of points and the clearing of signals in the proper sequence for succeeding trains.

In some previous installations where storage of controls is practised, the storage takes the form of punchings on a tape. This practice makes it difficult to alter the programme afterwards if traffic circumstances require a change. In the Mouchard-Frasne installation, the routes are electronically stored, and changes in programme can be very simply made by actuating a few pushbuttons. Although the programmer installation at Mouchard was initially provided with storage capacity for four movements, this capacity can be readily increased.

There are two sets of indications: repeater indications of the track circuits, showing the actual position of trains on the line and indications signifying the routes for the trains that the despatcher has set up.

As a train progresses along the line, the indications of its route-setting are stepped down from one level to another.

As examples: the arrival of train No. 1 at the approach to Pont-d'Hery sets up its predetermined route through the loop. In this section, the same train, leaving the Mesnay-Arbois to Pont-d'Hery single-line section, releases at one movement all the route-setting instructions stored in the No. 2 level of the control machine and shifts them down to No. 1 level. Immediately after this



Map showing position of Mouchard-Vallorbe line in relation to French railway network

transfer the routes stored in No. 3 level are shifted to the now-free No. 2 level.

The flexibility of this system is such that the despatcher, faced with a new or unexpected traffic condition, can cancel the "stored" route by repeating the operating procedure used for setting up that route. The despatcher is not committed to any pre-set conditions enforced by the automatic equipment, or by the programme sequence which he may have set up earlier. It permits him to over-rule instructions that have already been set up and to send priority messages, such for example as would be needed for an emergency closing of the line.

Operational economies

Modernisation of the signalling over this important route has permitted considerable operational economies to be realised, both in the reduction in the number of signalmen needed and in the important respect of the change-over of so considerable a proportion of the mileage from double to single track. On a line of such heavy traffic at peak hours, such singling would have been impossible but for C.T.C.

The reduction in the number of running lines will no doubt lead to considerable economies in civil engineering maintenance; in addition, it makes possible a much more ready access to the fabric of the many tunnels on this route for inspection and repair, without any interruption of traffic.

Repair of tunnels

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Manufacturers concerned

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25-kV electrification on the South Eastern Railway of India

(*Concluded from page* 222)

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Civil engineering works

Because soil pressures vary greatly in this area, each mast foundation must be carefully designed. In soft black-cotton soil waterproof aprons round them are necessary, and pile foundations were required on a 32-ft.-high flyover embankment. On some long bridges special foundations were needed on strengthened piers. Tracks have had to be lowered to provide adequate clearance under a flyover and two road bridges and 11 overbridges have had to be raised. Necessary structures included a large locomotive shed at Tatanagar, a smaller one at Dangoaposi, a control centre at Chakradharpur, 239 units staff quarters, and six maintenance depots for overhead equipment.

At 11 stations low-tension lighting wiring had to be removed to protect it from high-tension induction, and 100 service buildings had to be provided with lighting and fan equipment. Nine high-tension lines had to be modified where they crossed electrified tracks. Transformers had to be installed to reduce 25-kV. current to 230 V. to supply power for colour-light signalling at various stations, and battery equipment was provided for remote control of points and traction power, section by section.

This latter is in the form of sectionalised overhead equipment, generally in lengths of six to ten miles, to permit isolation of sections when necessary. In the remote-control centre at Chakradharpur, switches can operate 103 interruptors and 11 oil circuit-breakers at 26 switching stations, including the feeds at the five substations.

The locomotive units are of the a.c. Bo-Bo type weighing 73 tons and powered by four 700-h.p. 1,250-V. d.c. motors. The 25,000-V. single-phase a.c. current drawn from the overhead wiring is transformed and then rectified through water-cooled ignition rectifiers. Each unit can haul 3,600 tons on the level, but on the ruling gradient of 1-in-100, heavy trains are worked by two units in multiple unit.

Signalling and wiring protection

Wherever visibility of existing semaphore signals was interfered with by overhead traction wiring the signals were lowered, raised, or re-located. Where any of these courses was impossible they were replaced by colour-light signals. For the protection of cabin staff insulated joints were provided in point-rodding and signal wires. Overground wiring was replaced by underground cables for signalling. This practice also caused a great volume of work for the Posts & Telegraph Department in the replacement of telephone and telegraph wires by underground cabling to avoid interference by induction from the high-tension traction lines.

No fewer than 28 out of the 41 yards in this area had to be remodelled, and these and other line-capacity works were carried out without interference with electrification construction, and with minimum delay to the rapidly-increasing traffic.

In this connection, it may be noted that the already-heavy iron-ore, coal, and limestone traffic in this area is now catered for by the following daily freight-train service. There are 13 trains of iron ore from Dangoaposi, 8 of them double-headed, feeding the steel plants at Durgapur and Tatanagar; seven more trains will carry limestone from Chakradharpur. Coal is being moved by five trains from washeries near Anara to Tatanajar. Twelve other trains will usually be required to carry the general goods including finished steel products, and five more to carry iron-ore to Calcutta for export.

On an average, 42 loaded trains—including 26 requiring double-heading—and 22 trains of empties will move about 11·72 million gross ton-miles a day on the already electrified sections. It is estimated that in fuel alone there is a saving of about £172,500 yearly by substituting electric for steam traction.

INDIAN ELECTRIFICATION

On July 22 the Asanol-Dangoaposi and Chakradharpur-Tatanajar sections of the South Eastern Railway, together comprising over 185 route-miles of line were worked for the first time by electric traction on the 25 kV. 50-cycle, single-phase, a.c. system. This route-mileage is, with the exception of 10½ miles, all double line, track-mileage electrified being 425. On these electrified sections the average traffic is 42 loaded trains, 26 of them double-headed, and 22 trains of empty stock daily. The aggregate movement is thus 19.2 million gross *tonne*-km. a day, and it is estimated that the electrification will save about £172,500 a year as compared with steam haulage.

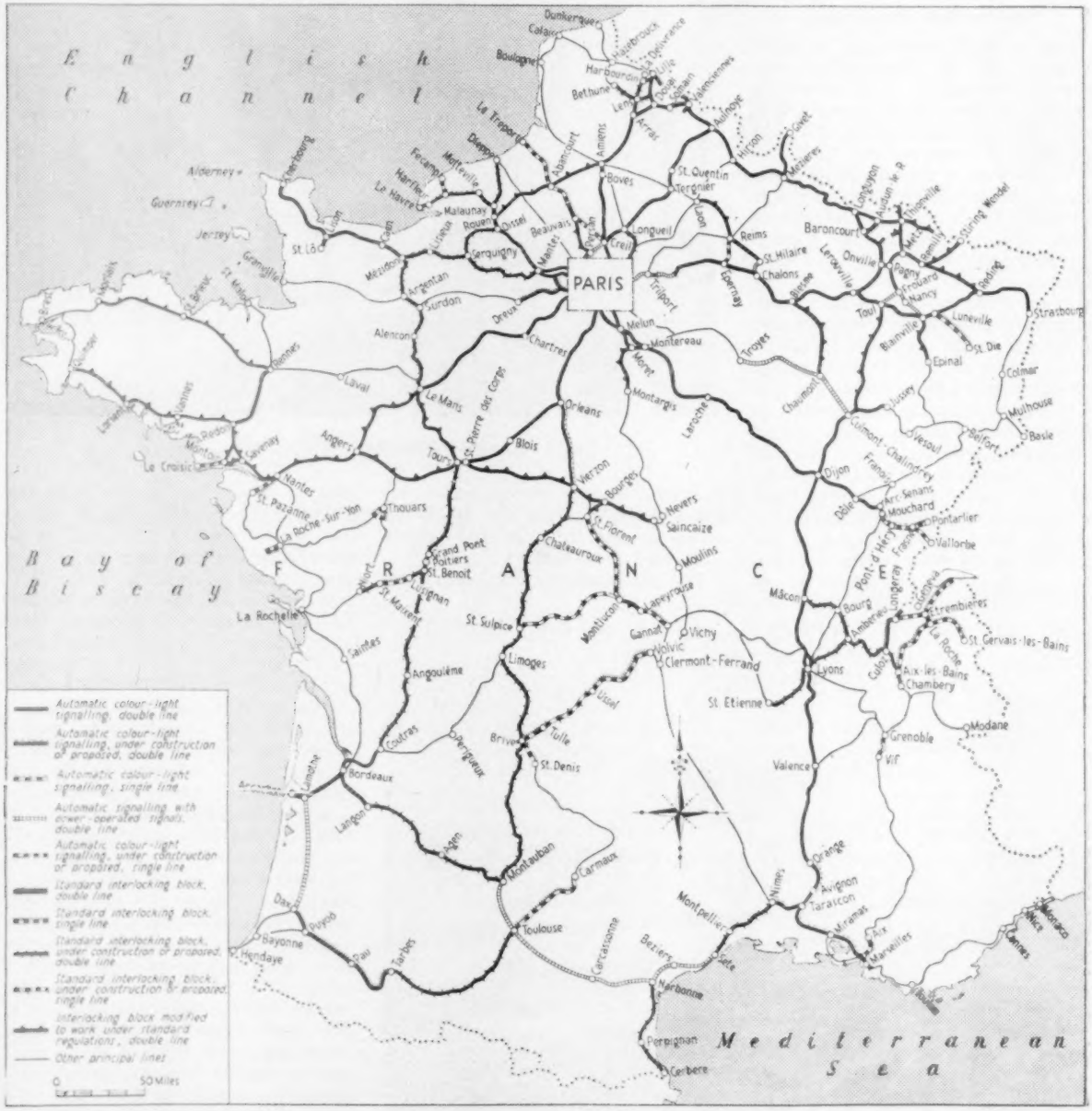
The C.T.C. system provides for the setting-up, by means of "flexible transit" relay units, of routes for all trains between Mouchard and Frasne. The programmer, which at present is located at Mouchard, enables the despatcher to set up complete routes through the section for as many as four trains. Controls necessary for the carrying-through of this programme are stored in the equipment and, as the trains progress along the line, those controls are released automatically to set up movements of points and the clearing of signals in the proper sequence for succeeding trains.

In some previous installations where storage of controls is practised, the storage takes the form of punchings on a tape. This practice makes it difficult to alter the programme afterwards if traffic circumstances require a change. In the Mouchard-Frasne installation, the routes are electronically stored, and changes in programme can be very simply made by actuating a few pushbuttons. Although the programmer installation at Mouchard was initially provided with storage capacity for four movements, this capacity can be readily increased.

There are two sets of indications: repeater indications of the track circuits, showing the actual position of trains on the line and indications signifying the routes for the trains that the despatcher has set up.

As a train progresses along the line, the indications of its route-setting are stepped down from one level to another.

As examples: the arrival of train No. 1 at the approach to Pont-d'Hery sets up its predetermined route through the loop. In this section, the same train, leaving the Mesnay-Arbois to Pont-d'Hery single-line section, releases at one movement all the route-setting instructions stored in the No. 2 level of the control machine and shifts them down to No. 1 level. Immediately after this



Map showing position of Mouchard-Vallorbe line in relation to French railway network

transfer the routes stored in No. 3 level are shifted to the now-free No. 2 level.

The flexibility of this system is such that the despatcher, faced with a new or unexpected traffic condition, can cancel the "stored" route by repeating the operating procedure used for setting up that route. The despatcher is not committed to any pre-set conditions enforced by the automatic equipment, or by the programme sequence which he may have set up earlier. It permits him to over-rule instructions that have already been set up and to send priority messages, such for example as would be needed for an emergency closing of the line.

Operational economies

Modernisation of the signalling over this important route has permitted considerable operational economies to be realised, both in the reduction in the number of signalmen needed and in the important respect of the change-over of so considerable a proportion of the mileage from double to single track. On a line of such heavy traffic at peak hours, such singling would have been impossible but for C.T.C.

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PERSONAL

British Transport Commission

MR. H. L. R. MATTHEWS, Chairman of Crosse & Blackwell (Holding) Limited, has agreed to become Deputy Chairman of a subsidiary company set up within the British Transport Commission to accelerate the development of railway property.

MR. S. ALLEN, Chief Inspector, Norwich, British Transport Commission Police, Eastern Area, has retired from the Force.

Sir Philip Warter

SIR PHILIP WARTER, part-time Member of the British Transport Commission, who has been appointed Deputy Chairman of the Commission, has been Chairman of the Southern Area Board of the B.T.C. since 1955, and a part-time member of the Commission since June, 1958. He was Director of Warehousing in the Ministry of Food in 1940. Controller-General Factory & Storage Premises, Board of Trade, 1941-45, and Adviser to the Board of Trade on Industrial Estates, 1945-46. He received a knighthood in January, 1944. Sir Philip Warter is Chairman of Associated British Picture Corporation Limited, Enfield Cables Limited, and Union Cinemas Limited. He is also a Director of the British & Foreign Wharf Co. Ltd.

MR. P. SHIRLEY, Chairman of Batchelors Foods Limited, who has been appointed a full-time Member of the British Transport Commission, was born in Sydney, Australia, in 1912 and was educated at Shore School in the same city. Later he qualified as a Chartered Accountant (Australia), and in 1936 he came to England for further training and has lived and worked here since then. After experience with a leading firm of Accountants in this country, he became Chief Accountant of Unilever Limited. In this position he visited most of the 400 Unilever Companies in Britain and Overseas. In 1958 he was appointed Chairman of Batchelors Foods Limited. He is a member of the Board of Referees set up under the Income Tax Acts.

Mr. P. Shirley

MR. L. H. WILLIAMS, until recently Managing Director of the Shell Chemical Co. Ltd., who has been appointed a full-time Member of the British Transport Commission, was born in 1909 and educated at Portsmouth Grammar School and Jesus College, Cambridge. In 1930 he joined the Royal Dutch/Shell Group and was employed in Kenya and Uganda. In 1941 he was appointed Adviser on oil supplies to the Occupied Enemy Territories Administration at Addis-Ababa, and from 1942 to 1945 he served in West Africa, where his responsibilities included the organisation of emergency bunkering facilities in Freetown Harbour, Sierra Leone, and of Air Force refuelling arrangements at Bathurst, Freetown and Takoradi. On return to England in 1945, he studied potential outlets for petroleum Chemicals in the United Kingdom market, and in 1947 he returned to Africa to survey prospects for chemicals in Africa and the Middle East. This survey led to the formation of separate chemical companies based on Johannesburg, Cairo and Tel Aviv. In 1948 he was appointed as the first General Manager of the Shell Chemical Company for East and South Africa (Johannesburg), and three years later he returned to England and served with the Chemical Industry Administration of the Shell Petroleum Co. Ltd., where he was responsible for the international marketing of Shell chemicals outside North America. In 1955 he was responsible for the incorporation of Petrochemicals Limited and associated Companies into the Shell Chemical Co. Ltd., and became, between 1955 and 1960, Managing Director, Shell Chemical Co. Ltd., Managing Director

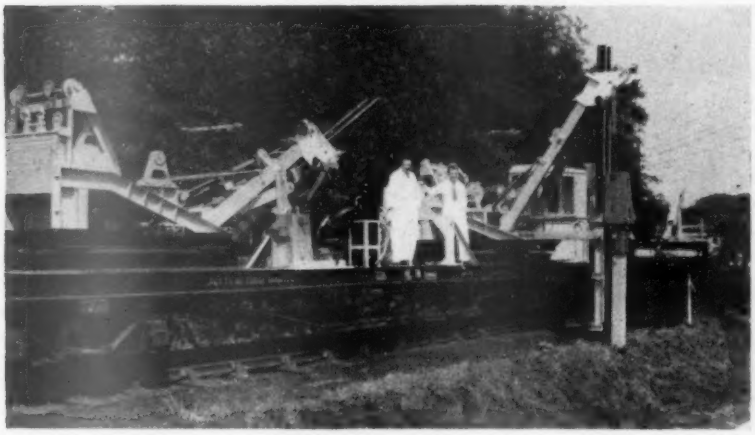
Mr. L. H. Williams

Petrochemicals Limited, Chairman Styrene Products Limited, and a director of Styrene Co-Polymers Limited. In June, 1961, he retired from the Shell International Chemical Company.

Royal Engineers

We regret to record the death, on August 18, of BRIGADIER W. G. TYRRELL, D.S.O., formerly Commandant, Longmoor Camp, Royal Engineers. Brigadier Tyrrell was commissioned in 1903 and trained at the School of Military Engineering, Chatham. In 1905 he was attached to the London & South Western Railway for further training, and was promoted to be Lieutenant. A year later he was posted to the 10th Railway Company, R.E., at Longmoor. From 1908 to 1913, Brigadier Tyrrell was seconded to the Canadian Forces, and in 1913 he returned to the Depot Battalion and was promoted to be Captain. On the outbreak of war in 1914, he was posted to Longmoor to command the 10th Railway Company. Before proceeding with the Company to France, he collated invaluable information relating to European railway systems. After service in France, he was posted to Palestine as Officer i/c Military Railways, and was responsible for the construction and operation of the Military Railway from Kantara across the Sinai Desert into Palestine. He was awarded the D.S.O. in 1917, and promoted to be Major a year later. After the 1914-18 war he served in Southern Ireland and India, and was promoted to be Lt.-Colonel in 1929, and Colonel in 1933. In that year he was appointed Assistant Director of Transportation at the War Office. He retired from the active list in 1938 with the honorary rank of Brigadier, but was recalled on the outbreak of war in 1939, as Commandant at Longmoor, which appointment he held until his retirement in 1941.

NEW EQUIPMENT *and Processes*



HYDRAULIC PILING MACHINE

The Civil Engineering Department of the North Eastern Region has recently put in service a new type of rail-mounted all-hydraulic piling machine.

The unit has been built to drive 8-in. sq. precast reinforced concrete piles at 27-ft. 6-in. intervals along railway embankments. The piles bear the pre-stressed concrete cable ducts being laid to carry signalling cables along much of the Region's main line. Two piling units are mounted on a 46-ft. bogie bolster type of wagon at 27-ft. 6-in. centres.

Each unit comprises a slewing ring mounted on the strengthened wagon frame. A box-section rotating platform carries an "A"-frame and is powered by a Derisine hydraulic type S/5 motor. It can be rotated through 90 deg. to each side of the centreline of the wagon.

On the back end of the "A"-frame is mounted a grooved winch drum also powered by a Derisine hydraulic type S/5 motor. The wire rope on this drum feeds the concrete piles to the leaders. Mounted centrally on the "A"-frame is a winch drum driven by the same type of hydraulic motor carrying the wire rope which controls the drop hammer.

Derricking action

Mounted in slides at the rear end of the "A"-frame is a counterbalance weight which through a series of pulleys, is linked to the derricking action of the jib, which is separately controlled by twin double-acting 3-in. dia. hydraulic rams.

The main jib is of channel-section construction, pin-jointed to the foot of the main "A"-frame. The jib head carries the main sheave over which passes the drop-hammer suspension rope, twin sheaves for the pile-feed rope, slides within which the leaders are extended and retracted, and lock screws operated from ground level to lock the leaders in position. Retaining hooks on the jib head hold the drop hammer at the top of the leaders when not in use.

The leaders, formed by 6-in. x 3-in. channels assembled back-to-back, pass through the jib-head slides at their top ends and are extended to the working position and retracted to the travelling position by double-acting hydraulic rams. One ram is of $3\frac{3}{4}$-in. dia. and fitted at both ends with twin sheaves so that extension hoists the leaders through the jib head. This action is assisted by the other ram of $3\frac{3}{4}$-in. dia. This ram is also used to locate the leaders for working.

The leaders are supported by two slotted sliding members which are retained by pins located in the slots and which slide within the main "A"-frame on the rotating platform.

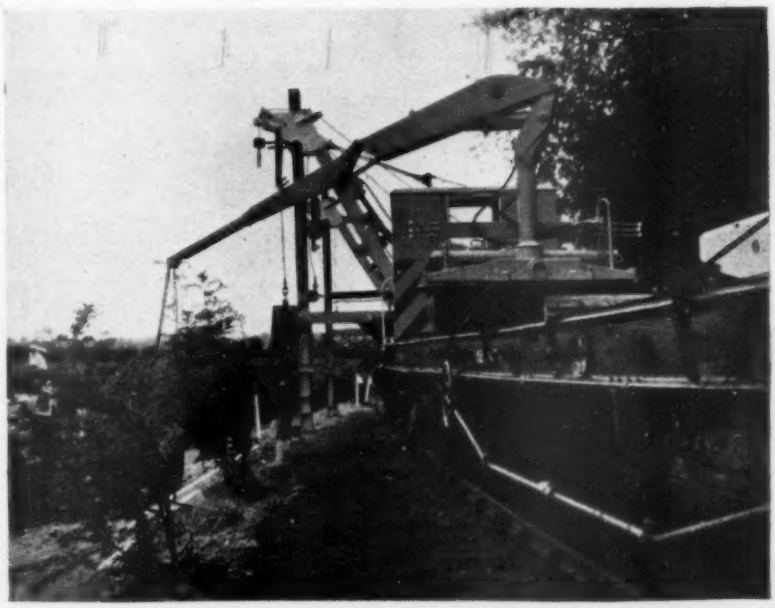
Sliding within the leaders is the 1-ton drop hammer, below which is located the pile helmet.

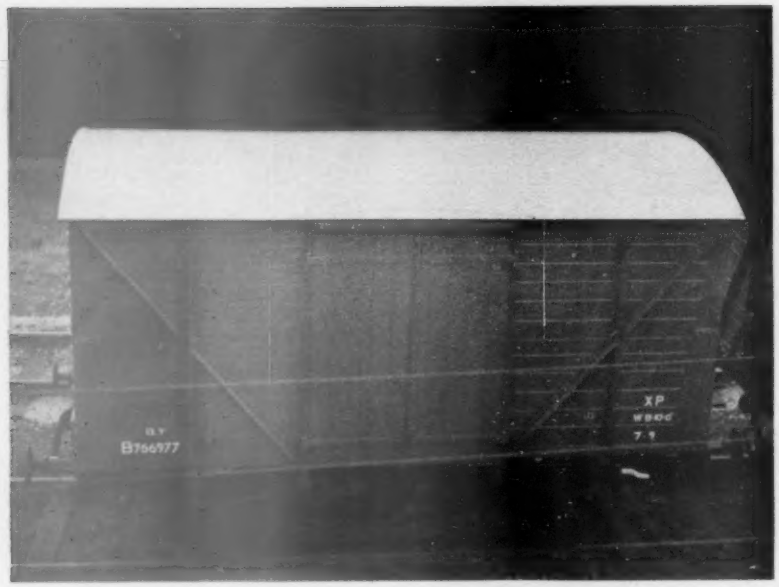
Each piling unit is separately controlled from a sheet metal cab located at the ends of the wagon. Within the cab there is a bank of seven Dowty four-way type valves controlling the various operating circuits.

The operation of the drop hammer is controlled through a 14-in. dia. Croft clutch which in turn is operated by a hydraulic cylinder controlled from the cab. To ensure that the wire rope connected to the hammer does not overrun when the hammer is dropped, the drum is fitted with a Lockheed-operated brake band controlled from the cab by a foot pedal.

Air-cooled power unit

The main power unit is a Ruston air-cooled diesel located on the wagon between the two piling units. This engine drives twin hydraulic pumps delivering 28 gal. per min. at a pressure of 1,000 lb. per sq. in. to the main motors on each unit. Two smaller hydraulic pumps, delivering 5 gal. per min. at 1,000 lb. per sq. in., provide power to the ram and slewing circuits. All motors are interchangeable to facilitate maintenance and to cater, within the machine itself, for the eventuality of a motor failure.





Floodlighting for night working is provided by a 1-kW. generator driven from the main engine while emergency lighting is provided from the 12V. battery circuit.

The piling unit is used in conjunction with twin "Lorry Loader" type of hydraulic cranes specially adapted as independent power units and mounted on another bogie bolster wagon. This carries the concrete piles to be driven.

This wagon is coupled to the piling equipment wagon. Piles are laid in position using "Hiab" lorry-loader crane units mounted on the wagon at 27-ft. 6-in. centres.

The whole equipment is manned by a crew of eight men and piles are driven on an average at a rate of 16-20 per hr.

The equipment has been developed under the direction of the Chief Civil Engineer, North Eastern Region, and constructed in the Regional Workshops at York.

TACHOMETER TESTER

The Bryans dual tachometer tester is a dual stroboscope providing facilities for calibrating and testing speed.

Adaptor gearboxes and adaptor couplings are supplied to cover many types of instruments, and are contained separately in a metal stowage case, together with leads and spare neostrons.

The unit is supplied with a transistorised tuning fork, which provides a stable frequency of 50 cycles for operation of the neostron lamps, and a load test panel, for testing currents, voltages and loadings of the three-phase type of engine speed generators.

The tester has a range of 200-6,000 r.p.m. generator speed when used with the adaptor gearboxes supplied.

Operation is from a 220-250-V. a.c. 50 cycle supply.

Further details may be obtained from Bryans Aeroquipment Limited, Willow Lane, Mitcham, Surrey.

PLASTIC ROOFING FOR WAGONS

British Railways is experimenting with reinforced plastic roofing for covered merchandise wagons. The plastic is reinforced with Deeglas glass - fibre chopped-strand mat Type A106.

Reinforced plastic laminates are resistant to rust, rot, corrosion, and weathering. Maintenance costs are virtually eliminated and, in the event of damage, repairs can be quickly, simply, and economically carried out.

Further information can be obtained from Deeglas Fibres Limited, Prince Consort House, 27-29, Albert Embankment, London, S.E.1, or from Mickleover Transport Limited, at the works of which company at Park Royal, London, N.W.10 the roofing is being applied.

TRAFFIC BARRIER

The Pullin traffic control barrier is primarily for controlling vehicular and pedestrian traffic on factory roads. It is made of a light tubular alloy and can be fabricated with an arm of any length up to 16 ft. 4 in. The arm carries large circular "stop" signs.

When several barriers are being used in conjunction, they can be remotely controlled from a panel which provides automatic interlocking. When barriers are out of sight of the operator, a system of warning lights can be incorporated.

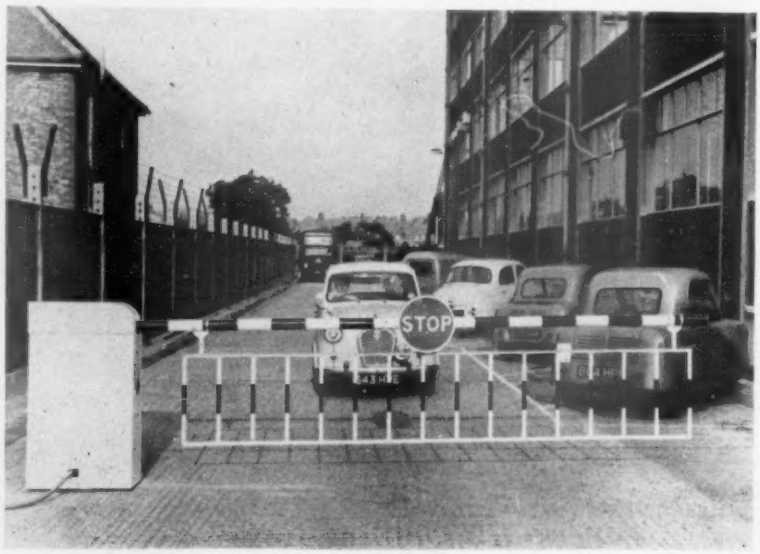
The barrier arm is clamped in a split-steel trunnion which is supported on the main frame by ball races in rigid plummer-block housings. The main frame is mounted on a stout post.

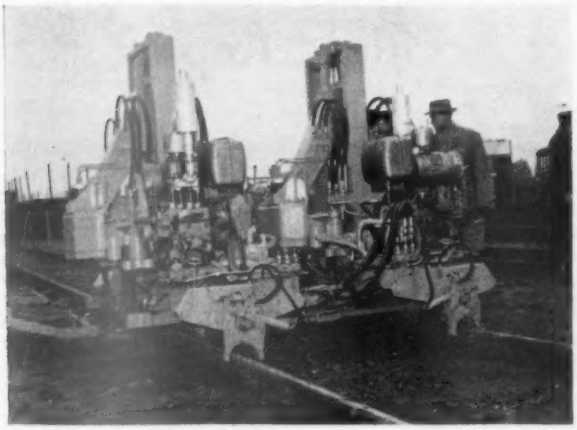
The $\frac{1}{8}$-h.p. motor and gearbox are totally enclosed and the barrier is operated from the gearbox through a friction clutch. The clutch torque is set so that it is only just sufficient to raise the barrier; this prevents damage to the gearbox if the barrier should be forced by an external impact between its limits of travel.

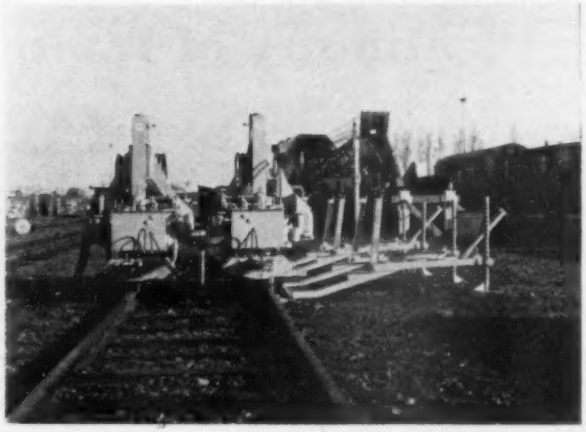
Normally, two methods of operating the barrier are used. One is by relay control for interlocking with other barriers. The other method is by a manually operated switchboard.

A transformer is incorporated to reduce the mains voltage feeding the warning lights to 24 V. This is to prevent risk of fire should the arm be struck by a vehicle carrying explosive or inflammable material.

Further details may be obtained from







R. B. Pullin & Co. Ltd., Phoenix Works, Great West Road, Brentford, Middlesex.

SMALL TAMPING MACHINE

A small, one-man-operated fully-hydraulic tamping machine with full-size heavy-tamper tamping units has been developed which is suitable for the tamping of wooden, steel, and concrete sleepers so that all types of ballast—even coral and encrusted—can be tamped. The machine is available for standard, wide, or narrow gauge.

The tamping tools work on a torsional or rotary oscillation system, using 16 tools which can also be opened automatically to permit tamping of double sleepers. The tools are closed in pairs over a circular arc so that they no longer move in a straight line but progress with increasing compression the more closely they approach the sleeper where rail and sleeper cross. The tools close hydraulically and compression pressure can be separately adjusted for each of the two units. Any angle of the tools can be selected by adjustment.

The tools work on this machine according to the " non-synchronous " system. The vibrating generator is driven hydraulically by an oil motor. Source of power is an air-cooled diesel engine of approximately 14 h.p. at 3,000 r.p.m.

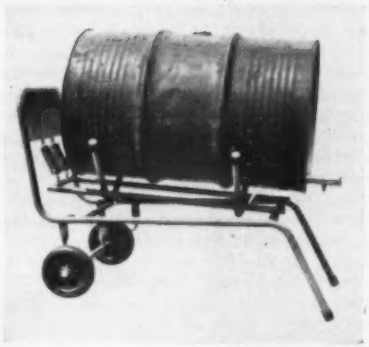
The machine is fitted with four hydraulically - operated clamping devices which lock it in position at each sleeper while working, and is supplied with a set-off equipment (shown in the illustration), so that both units can be taken off the rails in the shortest possible time.

For standard working both sleeper ends are tamped simultaneously, or a cross-strut can be supplied to enable the machine to work as a single-track tamping tool. A special device can also be supplied for tamping points and crossings. Each of the two tamping units weighs approximately 470 lb., and the machine has an output of up to 400 ft. per hr., depending on sleeper pitch.

Further details can be obtained from Plasser Railway Machinery (G.B.) Limited, 77-79, Charlotte Street, London, W.1.

BARREL TRUCK

The barrel truck illustrated can be easily moved by one man. The spring-assisted platform tilts the barrel when it



is becoming empty, enabling the full contents to be discharged.

The price, ex works, is £6 10s.

Further particulars can be obtained from Springclere Products Limited, Atlantic Wharf, East Dock, Cardiff.

HYDRAULIC CRANE

The Austin-Western model 210 hydraulic crane has four-wheel steering, and is very manoeuvrable.

The lifting capacity is 14,000 lb. at 6 ft. radius and 5,100 lb. with the boom fully extended to 18 ft. Boom extensions are available, giving additions of 6, 12, and 17 ft. With these in use the boom lengths become 24, 30, and 35 ft. and the lifting capacities 3,500, 2,300 and 1,750 lb. respectively. The swinging mechanism gives a continuous rotation of 360 deg. Hydraulic outriggers ensure complete stability on uneven surfaces.

The wheelbase is 8 ft. 6 in. and the radius of the turning circle 15 ft. 8 in. without outriggers, and 17 ft. 8 in. with them. The headroom is low; with the boom horizontal the hook-to-ground measurement is 5 ft. 7½ in.

Many attachments are available, including maintenance platform, bulldozer, and snowplough equipment, and flanged wheels for rail use.

Further details can be obtained from Jack Olding & Co. Ltd., Hatfield, Herts., the sole distributor for the cranes in England, Scotland, and Wales.

Ministry of Transport Accident Report

Collision at Royton, British Railways, London Midland Region, on February 8, 1961

Colonel J. R. H. Robertson, Inspecting Officer of Railways, Ministry of Transport, inquired into the collision, at about 6.12 a.m. on February 8, 1961, at Royton, a terminal station on a spur about one mile long from the Manchester (Victoria)–Rochdale line near Oldham in the London Midland Region, British Railways. On a fine morning after rain the driver of the 6.5 a.m. Shaw to Royton four-coach empty diesel multiple-unit train lost control of it on the steeply falling gradient approaching Royton station. The train collided with the buffer stop at 40 m.p.h. and went through it and the 18-in. thick stone wall behind it. The leading coach then dropped some three feet on to High Barn Street beyond the wall, and proceeded across the street and smashed through two houses on the opposite side. Two adjacent houses were also badly damaged. The leading end of the second coach did not drop, although its bogie fell from under it. Instead it over-rode the rear end of the front coach, staving in its end panels to a depth of about 2 ft. The last two coaches were undamaged and were not derailed.

The ground floors of the two houses into which the train crashed were at that time unoccupied, but five people who were then upstairs in one of the houses were injured. The driver jumped from his cab to the platform just before the train hit the buffer stop, and suffered minor injuries. The guard, and a railway fireman who was travelling in the train on his way home after coming off duty, were uninjured.

Description of line

The steepest gradient from Royton Junction on this line is 1 in 62, easing to 1 in 71 and then to 1 in 150 over the last 500 yds. to the Royton Station buffer stop. The severity of the gradient is apparent to the eye, and at its top a notice-board instructing drivers of freight trains to pin down brakes is an apt reminder.

The train comprised two two-coach sets, each of two power coaches. The leading set comprised two Rolls-Royce/Craven power coaches, each with one 238-h.p. diesel engine with mechanical drive. The trailing set comprised two A.E.C./Craven motor coaches, each with two 150-h.p. diesel engines again with mechanical driver. The drive from each engine comprised a free-wheel device and a four-speed gear-box. The control system was electro-pneumatically operated.

The train was fitted with Gresham A.I.V. quick-release automatic-vacuum brakes without direct-admission valves. The quick release is obtained by absorbing the air in the train pipes into large vacuum release reservoirs in which a high degree of vacuum is maintained. The degree of vacuum available for brake release, known as the "high vacuum," is recorded on the "release-pipe" side of a duplex vacuum gauge in the driver's cab. With this equipment release times are very short, even when the exhausters are idling, but they can be reduced still further by simultaneous acceleration of the exhausters. All wheels on the train were braked, and the brakes were compensated to the extent that the braking force on all brake blocks operated by the same vacuum brake cylinder was the same. The braking efficiency through the train was reasonably even.

The gauge in the guard's compartment showed only the train-pipe vacuum and not the release reservoir vacuum. Both vacuums were shown on the driver's duplex gauge, which was easy to read. There was a speedometer in the driver's cab, this being driven from the leading (non-driving) axle.

Brakes in good order

Evidence from a carriage and wagon examiner showed that on the day before the accident the brakes were in good fettle. The signalman in Royton signal box, 490 yd. in rear of the buffer stop, said that he heard the driver hooting, which was unusual, and noticed that the train was striking sparks from the track. A leading porter on duty in the station thought that the train entered the station at between 30 and 40 m.p.h. On the previous day it had entered the platform very slowly.

The guard of the train said it first worked as a stopping passenger train from Manchester (Victoria) to Shaw. There were nine stops, all of which were made normally, the vacuum being reduced from 20 to 15 in. During its return trip as an empty train from Shaw to Royton Junction he and the driver had not changed ends, so he occupied the driving cab at what had become the front of the train. The train-pipe vacuum was then again 20 in., but he did not observe the high-release vacuum. The train reversed again at Royton Junction, thus bringing the driver to the right end for the final run to Royton Station.

The guard said that normally the driver of a diesel train running into Royton Station first applies the brakes near Turf Lane Bridge (about ¼ mile from the buffer stop). At the time he was in the brake van in the third coach, and thought that this brake application had been made at the usual place. He said the train passed the signalbox at its usual speed, estimated by him at 25–30 m.p.h. His impression was that the train's speed later increased to 40 m.p.h. He could not himself apply the brakes, as he had already left the brake van. He added that he felt only one brake application, which was a normal one in the normal place; the only abnormality was that he could still hear the engine running very fast as the train entered the station.

The fireman, who was travelling in the train said that he felt a touch of the brake when the train was about 100 yards short of Royton signalbox; he thought that the speed was then some 35 to 40 m.p.h., and that the brake application did not reduce it. As the train entered the platform, he felt that it was going too fast.

The driver said that during his trip to Shaw the brakes acted properly and were in good fettle. He admitted that he had not changed ends at Shaw, but had driven and braked from the rear end, on signals from the guard at the leading end and from his own observation of the signals as he leaned out of his cab with his finger on the "dead man" cancellation button.

Previous trip

He was questioned about his trip on the previous day, when the train entered the platform "very slowly." He said that he had coasted down the steep gradient in fourth gear, and had made his first brake application at Turf Lane Bridge, not quite ½ mile from the buffer stop. This application reduced the vacuum from 20 to 15 in., and he regarded it as the brake test laid down in the rules when a driver is approaching a terminal station on a steeply falling gradient. He applied the brakes a little harder until he reached the signalbox, when he had the train well in hand. On that occasion his four-coach train had four and not six motor bogies.

On the day of the accident his initial brake application, when approaching Turf Lane Bridge, was quite normal and exactly the same as on the previous day. His train-pipe vacuum was 20 ins. and he had plenty of high vacuum. He reduced the train-pipe vacuum by "the usual 5 in. and a bit more, 6 or 7 in." He then got the impression that the brakes were on the point of locking on to the wheels, and he released them quickly and then applied them again, reducing the vacuum again by 5 or 6 in. By this time he was getting nervous that he was going too fast. He said that the second brake application seemed to hold the train for a short time then he thought that the train had begun to skid.

He put the brake handle into full release position, and then put the gears into neutral and accelerated the engine to get increased vacuum and to speed release. By this expedient he quickly raised the train-pipe vacuum to 20 in., but the brakes stayed locked and the speed of the train seemed to increase. He realised that he was in serious trouble and that time was short, as he was now running between the signalbox and the start of the platform. He next tried to free his brakes, which he was convinced were still locked, by applying power to the wheels to force them round; he changed from neutral to fourth gear and "just gave her a kick." Even this expedient, which he had never had cause to use before, did not release the wheels, and the whole train continued to skid. He was now running into the platform and he began to sound the horn. He realised that his only chance of survival was to jump clear, so he pulled the brake handle over to the fully applied position, and jumped to the platform in a crouching position. The thing that he had wished for more than anything else that morning was "two good sanders."

His recollection of events was reasonably good, but his reasons for thinking that the

train was in a skid were not very convincing. He said that he had never been in a serious skid before. He gave the impression that the main reason why he thought that the train was skidding was because his speedometer went back to zero.

Findings after examination

An examination of the train after the accident revealed only slight marks on the tyres of the wheels, and no flat places. The rear set of two cars was not derailed, and after being uncoupled was driven back to Newton Heath. During this journey the cars ran smoothly, indicating no flat places on the tyres. The brakes were in frequent use, and worked normally. An examination of the track revealed no skid marks on the rails or anything else that might have afforded a clue to the nature of the runaway.

An examination of the brake blocks on all four coaches revealed no imperfections sufficient to have affected materially the train's braking power. It was clearly undesirable to make any high-speed braking tests into a terminal station such as Royton, but tests were made on various gradients elsewhere. These showed that, if the driver first applied his brakes when passing Royton signalbox at 40 m.p.h., the equivalent of the train involved in the accident should stop with its cab not more than 247 yds. past the signalbox; with an initial speed of 50 m.p.h. the train should stop with its cab rather more than half way along the platform.

Colonel Robertson said that he was satisfied that the brakes on the train were in good order and that the release vacuum pipe was properly connected throughout the train, thus ensuring a quick brake release on all four coaches. He was also satisfied that, if the train and brakes had been properly handled, the driver would have had no difficulty in stopping the train short of the buffer stop. The driver was alone responsible for this accident.

The driver might well have made his first brake application rather later than he said he did and therefore a little more sharply than usual. Where he made his first mistake was difficult to say, but Colonel Robertson was sure that he was mistaken when he thought that his wheels were still locked and that the train was still skidding. Even if the whole train had been skidding when he started to re-create vacuum the second time, Colonel Robertson believed that it would have stopped skidding as the brakes released. He also believed that the brakes were fully off and the train running freely when the driver put power to the wheels. If this was so, the train accelerated under power into the station and the final brake application could have had little time to take effect. Whatever other mistakes the driver may have made, his resort to such a desperate and untried expedient was, in Colonel Robertson's view, a cardinal one.

Precipitate braking?

In the light of the evidence of the two other men travelling on the train, it may be that the driver, anticipating a skid, released the brakes too soon after the first application and before they had really taken hold; and that he made his second application too firmly so that the train skidded before the brakes had much effect. In any case he made mistakes that should not have been made by a driver of his experience. Yet he did his best to gain control of his train once he had lost it, and it is to his credit that he maintained his efforts to the last possible moment.

The approach to Royton is not unsafe, provided that trains approach it at a reasonable speed, but, in view of doubts among drivers as to the proper speed at which to approach Royton Station, the Railway officers have agreed to introduce a 30-m.p.h. speed limit into Royton Station from Turf Lane Bridge.

Enlargement at Hull and Huddersfield

British Road Services has just completed work on a general haulage depot at Leeds Road, Hull, and on widespread extensions and improvements to its parcels depot at Milnsbridge, near Huddersfield.

At Milnsbridge, B.R.S. has for some time been anxious to improve its facilities and when an adjoining cinema came up for sale its site was acquired. Operations at Milnsbridge have now been centralised instead of split between Milnsbridge and Nile Street.

The 9,500-sq. ft. platform at the Milns bridge depot is now 250 ft. long, and has backing up spaces for 50 vehicles.

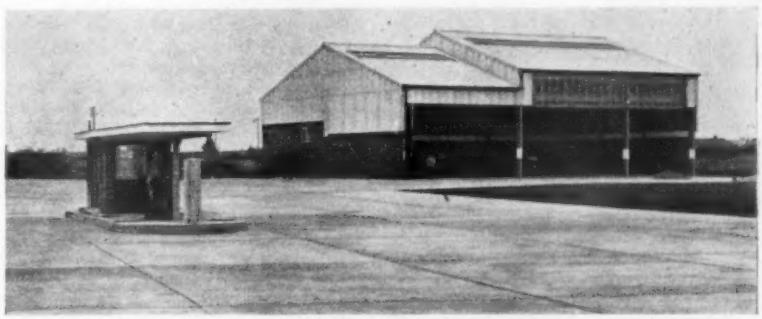
At Milnsbridge, 10,000 parcels, mainly textiles, are handled daily, and it is expected that development, in addition to centralising all Huddersfield services, will result in an increase in traffic handled. The depot operates 75 vehicles. Twenty-four services are despatched nightly to destinations throughout the country. Local collection and delivery services cover the West Riding of Yorkshire and just over the border into Lancashire daily.

A two-pit maintenance shop has been built. In addition to carrying out inspections and running repairs, this maintenance unit, within a mile of the Yorkshire-Lancashire trunk route, is conveniently situated to offer breakdown facilities for other B.R.S. vehicles.

The general haulage depot at Leeds Road, Hull covers five acres, and has a modern office block, transit shed, and engineering service station.

Report point and teleprinter terminal

There is a convenient report point for drivers which adjoins the traffic office and the staff have complete observation of the parking area and transit bay. A teleprinter terminal has been installed in the administrative offices. In the transit shed is a 2-ton traversing crane, and the fuelling island has been centrally placed between the transit shed and the service station to eliminate congestion. The service station has been erected well away



Transit shed at British Road Services' depot, Leeds Road, Hull

Enlarged British Road Services depot at Milnsbridge

from the transit shed and operating area. Two inspection pits have been provided, which together with free standings will accommodate five to six vehicles. High pressure lubricating systems have been installed. Adjoining the service station is a two-bay vehicle wash with two-gun washer. Near the administrative block, mess rooms have been provided.

Additional trains in North Eastern Region

In anticipation of heavy holiday traffic from stations in the South Yorkshire coalfield to Blackpool and Scarborough on September 2, when local colliery holidays start, the North Eastern Region of British Railways is to run additional trains to the two resorts.

A train to Scarborough, Filey and Bridlington will leave Bolton-on-Dearne at 8.35 a.m., Moorthorpe at 8.46 a.m., Pontefract Baghill at 9 a.m., and arrive at Bridlington at 10.50 a.m., Filey at 11.18 a.m., and Scarborough Londesborough Road at 11.35 a.m.

A train to Blackpool will leave Carcroft at 10.22 a.m., calling at South Elmsall at 10.32 a.m., Hemsworth at 10.41 a.m., Fitzwilliam at 10.47 a.m. and Wakefield Kirkgate at 11.14 a.m., and arrive at Blackpool South at 1.42 p.m., and Blackpool Central at 1.47 p.m.

Two additional trains will run in the reverse direction on Saturday, September 9.

Cleanliness drive in the North East

A drive to improve the standard of cleanliness at passenger stations in the North Eastern Region of British Railways began on Monday, August 21, when the "Tennant 80" heavy-duty power sweeper was introduced at York Station.

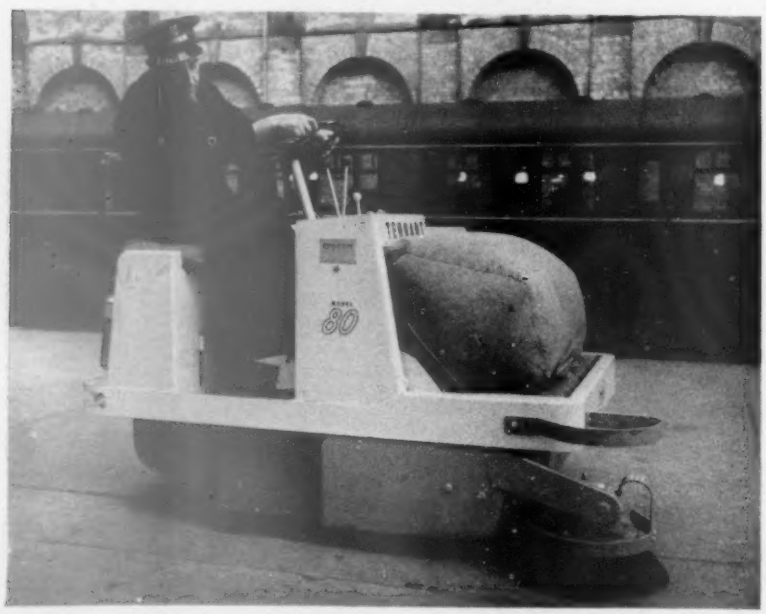
Worked by a petrol engine, the machine is driven by an operator seated at the rear, who steers it like a car. Its 42-in. brush follows the floor contours and will pick up all types of litter. A side brush sweeps débris into the path of the main brush, enabling a 53-in. width to be swept clean.

Dust and grit are separated from heavier sweepings by suction and until disposal are stored in a large fabric bag, on similar lines to the domestic vacuum cleaner. A dirt hopper holding up to 800 lb. of larger debris can be emptied automatically by depressing a lever. The sweeper has excellent manoeuvrability. It is designed to operate in most narrow spaces.

Thirty-eight large and six small litter bins have been installed on the station. All the bins are of the wire-basket type and are in metal containers of a bright and distinctive colour.

Forty posters exhorting the public to play its part in keeping the station tidy are prominently displayed.

The campaign at York is to be extended to other large stations in the Region.



Heavy-duty power sweeper in service with North Eastern Region, British Railways

REPLACEMENT FOR LANSDOWNE BRIDGE

Ayub arch which will replace Lansdowne Bridge over the Indus River, Western Pakistan

Staff & Labour Matters

Shorter working week: Railway shopmen

The Industrial Court has now issued its Award concerning the claim of the Employees Side of the Railway Shopmen's National Council for a reduction in the standard hours of duty of Railway Shopmen from 44 to 40 a week without loss of pay. The Court awarded that the hours of Railway Shopmen should be reduced from 44 to 42 a week without loss of pay, and remitted to the parties for discussion and agreement the means by which this reduction in hours should be implemented and the date from which it should be effective. The Award provides that if the parties fail to agree by October 21, 1961, upon an effective date for the reduction, either party may ask the Court to determine the matter.

Rates of pay of British Railways Salaried & Conciliation Staff

At a meeting of the Railway Staff Joint Council held on August 21, representatives of the National Union of Railwaymen, the Associated Society of Locomotive Engineers & Firemen and the Transport Salaried Staffs' Association presented their claims for improvements in the rates of pay of British Railways Salaried & Conciliation staff. The representatives of the British Transport Commission undertook to examine the submissions and to give their reply at a further meeting of the Council.

CONTRACTS AND TENDERS

Springing for Stockholm Underground

Metalastik Limited has received an order for axlebox and bolster springing for 400 bogies for the Stockholm underground.

Matisa Equipment Limited (Paris) has received a contract for the execution of 30,000 welds in Liberia. The mobile Matisa flash-butt welding process will be used for welding rails into long lengths.

Matisa Equipment Limited (Switzerland) has delivered to Red Nacional de los Ferrocarriles Espanoles two heavy-duty automatic ballast tampers.

Siemens & Halske AG, Brunswick, has received an order from Pakistan Railways for 49 complete relay points equipments and ancillary block equipment. Improvements are also to be carried out on the present equipment of 15 stations in West Pakistan, and the sections of line they control are to be supplied with block equipment.

British Railways, Eastern Region, has placed the following contracts:—

Tarmac Civil Engineering Limited: resurfacing of bridge roadways in the Sheffield District;

Wm. Latimer & Co. Ltd.: cleaning and painting of Locomotive Works Manager's offices, carriage and wagon workshops and certain other buildings at Doncaster;

The Butterley Co. Ltd.: reconstruction of superstructure of underline bridge No. 465 between Darsham and Halesworth;

Felco-Moore Maintenance Engineers Limited: overhaul of four wharf cranes at Bow Creek;

Wellerman Bros. Limited: construction of new locomotive inspection pits at Doncaster Locomotive Works;

Wellerman Bros. Limited: strengthening of portion of superstructure of underline bridge No. 146 between Offord and Huntingdon (North);

Thomas Fletcher & Co. Ltd.: reconstruction of underline bridge No. 28 between Staveley (Central) and Heath;

J. Rata & Co. Ltd.: provision of thermal insulation to offices and stores at Doncaster Locomotive Works.

The Butterley Co. Ltd.: provision and erection of new crane girders to take a 30-ton crane in the Crimpsall machine bay at Doncaster Locomotive Works.

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From Australia:

800 axle boxes, cast-steel, roller-bearing type, suitable for use in, and to have a satisfactory life when fitted to, cast steel bogies for railway freight vehicles with a maximum speed of 60 m.p.h. and imposing a maximum static load of 19,650 lb. per axle box.

The tender No. is 61,995. The closing date is September 6, 1961. The Board of Trade reference is E.S.B./26720/61.

Supply, delivery and setting to work of 1 air-circulating tempering furnace in the spring shop at the railway rolling-stock workshops, Newport, Victoria, Australia.

The tender No. is 62,042. The closing date is September 6, 1961. The Board of Trade reference is E.S.B./26721/61.

65 pantographs suitable for electric current collection from the Corporation's 1,500V. contact wire system under the conditions of operation specified in Appendix "A" of specification and shall be suitable for installation on motor coaches of the Corporation's electrified rolling stock.

The tender No. is 62,026. The closing date is September 6, 1961. The Board of Trade reference is E.S.B./26722/61. The issuing authority for the above tenders is the Secretary, Victorian Railways, Melbourne, C.1, to whom bids should be sent.

From Chile :

51 lots non-ferrous metal rods and sheets: aluminium, copper, brass, lead, and zinc.

The tender No. is Group 12. The closing date is September 8, 1961. The Board of Trade reference is E.S.B./26493/61.

32 lots steel rods and sheets.

The tender No. is Group 28. The closing date is September 6, 1961. The Board of Trade reference is E.S.B./26493/61.

1,000 kg. aluminium ingots
8,000 kg. phosphoric copper ingots
27,000 kg. tin ingots
3,000 kg. white metal for locomotive bearings
25,000 kg. white metal for wagon bearings
20,000 kg. white metal for flanges and crossheads
4,000 kg. plumbago
20,000 kg. zinc ingots
120,000 kg. bronze ingots.

The tender No. is Group 24-II. The closing date is September 15, 1961. The Board of Trade reference is E.S.B./26492/61. The issuing authority for the above tenders is the Departmento Materiales y Almacenes' Ferrocarriles del Estado, Estacion Alameda, Santiago, to which bids should be sent.

From Egypt :

Material required for lock and block system—Cairo–Assiut Line.

Tenders will be received at the Materials and Supply Office, Way & Works Department, at Ramsis Square, Cairo, up to 12 o'clock on September 7, 1961, for supplying materials required for lock and block system Cairo–Assiut line according to E.R. Specification, copy of which can be obtained from the Materials & Supplies Inspectorate, Eng. Department.

The Board of Trade reference is E.S.B./25846/61.

From India:

146 items of railway equipment, including tyres for rolling-stock, wheels, and axles.

The issuing authority is the Director of Railway Stores, Rail Bharan, Raisina Road, New Delhi, to whom bids should be sent. The tender No. is GP. 25 of 1961. The closing date is October 4, 1961. The Board of Trade reference is E.S.B./25889/61.

10 1kVA. engine alternator sets.
The tender No. is Stores/Elec./61/ALD/89. The opening date is November 2, 1961.

4,500 depolarised wet air cells.
The tender No. is Stores/Sig./ALD/61/52. The opening date is November 6, 1961.

48 10kVA. auxiliary transformers.
The tender No. is Stores/Elec./61/ALD/92. The opening date is November 9,1961.

2 10kVA. engine alternator sets.
The tender No. is Stores/Elec./61/ALD/90. The opening date is November 10, 1961.

100 reverser posts type F. & S. design, 300 VAC.
The tender No. is Stores/Sig./ALD/61/59. The opening date is November 16, 1961.

350 reverser posts.
The tender No. is Stores/Sig./ALD/61/60. The opening date is November 17, 1961.

10,000 ft. c.i. pipe.
The tender No. is Stores/Elec./ALD/61/76. The opening date is November 27, 1961.

5 oil purification sets.
The tender No. is Stores/Elec./61/ALD/91. The opening date is November 28, 1961.

63 72V. battery chargers.
The tender No. is Stores/Elec./61/ALD/94. The opening date is December 4, 1961.

63 24V. automatic battery chargers.
The tender No. is Stores/Elec./61/ALD/95. The opening date is December 6, 1961.

20 transformers 110/110 V. 250 VA.
The tender No. is Stores/Sig./ALD/61/67. The opening date is December 11, 1961.

135 transformers 110/110 V. 150 VA.
The tender No. is Stores/Sig./ALD/61/68. The opening date is December 12,

2,970 luminous indicators.
The tender No. is Stores/Sig./ALD/61/69. The opening date is December 13, 1961.

760 signal colour lights, 2-aspect long and short-range.
The tender No. is Stores/Sig./ALD/61/70. The opening date is December 15, 1961.

220 lightning arresters.
The tender No. is Stores/Elec./61/ALD/93. The opening date is December 20, 1961.

50 terminal boxes for PILC DSTA cable 3,000 m.
The tender No. is Stores/Elec./61/ALD/78. The opening date is December 26, 1961.

27,000 yd. aluminium conductor with p.v.c. insulation.
The tender No. is Stores/Elec./61/ALD/79. The opening date is December 27, 1961.

32,200 m. Tropodur cable.
The tender No. is Stores/Elec./61/ALD/80. The opening date is December 29, 1961.

Tender forms are available from the Deputy Controller of Stores, 232 Lower Circular Road, Calcutta. No further information is available in Export Services Branch. The Board of Trade reference No. is E.S.B./24902/61.

From Pakistan :

56 chambers M.S. vacuum P.S. type, 3-ft. 1-in. x 12-in. x ½ in. thick (for B.G. Carriage) as per PE/SDP's sketch No. 1340/58C(1) and PRSS. No. R-3-49 (timber body carriages).

The tender No. is P5/EVB/69/60. The closing date is September 11, 1961. The Board of Trade reference is E.S.B./26738/61.

215 axle boxes C.S. machined with face plates 10 in. x 5 in. or 5½ in. x 7½ in. x 2½ in. groove for carriage and wagon.

The closing date is September 12, 1961. The Board of Trade reference is E.S.B./26754/61.

12,185 blocks I.R. (vulcanised) 6 in. x 2½ in. x 1¾ in. carriage body packings.

The closing date is September 7, 1961. The Board of Trade reference is E.S.B./26753/61.

7,530 pins H.T.S. yoke complete washers and split pin for coupling 6½ in. x 1⅛ in. (M.G.).

The closing date is September 12, 1961. The Board of Trade reference is E.S.B./26755/61.

1,090 mild-steel plates $\frac{3}{16}$ in. x 8 ft. x 4 ft.

710 mild-steel plates 8 ft. x 4 ft. x ½ in.

The tender No. is P2/GB4/146/61. The closing date is September 19, 1961. The Board of Trade reference is E.S.B./26758/61.

18 tons mild-steel billets, 6 in. x 6 in. width across flat. PRSS. No. M-3-49, Class I

28 tons as above, 6 in. x 6 in. width across flat. PRSS. No. M-3-49, Class IV

28 tons as above, 4 in. x 4 in. width across flat. PRSS. No. M-26-49, Class XI

28 tons mild-steel blooms, 8 in. x 8 in. width across flat. PRSS. No. M-3-49, Class III

35 tons as above, 8 in. x 8 in. width across flat. PRSS. No. M-3-49, Class IV.

The tender No. is P2/GB4/195/61/ACST. The closing date is September 21, 1961. The Board of Trade reference is E.S.B./26760/61.

17 tons mild-steel round ⅞ in.

25 tons mild-steel round ¾ in.

140 tons mild-steel round ⅝ in.

116 tons mild-steel round ⅜ in.

20 tons mild-steel round ⅛ in.

312 tons mild-steel round ½ in. all to PR No. M-5-55 Class II

35 tons mild-steel round 4 in. to PRS No. M-4-Class IV.

The tender No. is P2/GB4/198/61/ACST. The closing date is September 20, 1961. The Board of Trade reference is E.S.B./26759/61.

10,000 ft. mild-iron or mild-steel galvanised pipes with sockets 2½ in. bore

1,500 mild-iron or mild-steel galvanised bends with sockets for 2½ in. bore pipe

2 night soil carts.

The tender No. is P6/F1/80/61. The closing date is September 18, 1961. The Board of Trade reference is E.S.B./26739/61.

360 commodes, Indian type, complete with flushing tank, "S" trap and connecting pipes with all fittings. The tender No. is P6/F1/40/61. The closing date is September 18, 1961. The Board of Trade reference is E.S.B./26737/61.

7,000 sheets black mild-steel $\frac{1}{16}$ in. x 8 ft. x 4 ft.

The tender No. is P2/GB4/145/61/ACST. The closing date is September 23, 1961. The Board of Trade reference is E.S.B./26763/61.

18 tons mild-steel angle 2 in. x 2 in. x ¼ in.

16 tons mild-steel angle 3 in. x 3 in. x ⅜ in.

The tender No. is P2/GB4/97/61/ACST. The closing date is September 23, 1961. The Board of Trade reference is E.S.B./26762/61.

18 tons annealed round copper bars $1\frac{1}{32}$ in.

20 tons annealed round copper bars 1⅛ in.

22 tons annealed round copper bars $1\frac{3}{16}$ in.

The tender No. is P2/GB4/91/61/ACST. The closing date is September 25, 1961. The Board of Trade reference is E.S.B./26761/61.

The issuing authority for the above tenders is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

NOTES AND NEWS

United Arab Republic Minister's visit. Dr. Aziz Sidky, Central Minister of Industry, United Arab Republic, is on an official visit to the United Kingdom at the invitation of H.M. Government. He is to meet representatives of British companies interested in supplying machinery and equipment for use in the U.A.R.'s five-year plan.

Institution of Locomotive Engineers. The address of the Institution of Locomotive Engineers is now Locomotive House, Buckingham Gate, London, S.W.1; telephone No. Abbey 6672.

Closing of passenger station. The London Midland Region of British Railways is to close Stretton for Ashover Station, between Ambergate and Chesterfield, for passenger traffic on September 11.

Open day at Lancing works. The Southern Region of British Railways held an open day at its carriage repair depot at Lancing on August 23. Modern methods of carriage building and repair were demonstrated.

Change of address. The offices and workshops of Mullard Equipment Limited will be centralised at Crawley from September 4. The company's address from that date will be Manor Royal, Crawley, Sussex ; telephone No. Crawley 3421.

Westerham-Dunton Green branch line. The Westerham-Dunton Green branch line is to close on October 30. This closing follows the rejection, by the Minister of Transport, of the Central Transport Consultative Committee's recommendation that the line be retained as a social service.

Bearing company depot. The F.A.G. Bearing Co. Ltd. has opened a depot at 92, Broughty Ferry Road, Dundee, telephone No. Dundee 83745, to operate in conjunction with its Aberdeen branch office. The company's branch at North Shields has been transferred to 16, Dean Street, Newcastle-upon-Tyne; telephone No. Newcastle-upon-Tyne 24612.

Scandinavian road-rail bridge. A conference is to be held in Stockholm next month to discuss the provision of a road and rail bridge to link Denmark and Sweden. Two schemes proposed are a 24-mile bridge costing £70 million, between Copenhagen and Malmo, and a 9-mile bridge, costing £42 million, between Elsinore and Halsingborg.

WESTERN REGION "DEVONIAN" EXPRESS

"Devonian" express hauled by British Railways Sulzer Type 4 diesel-electric locomotive

Railway sleepers for Cuba. Cuba is to purchase 7 million cu. ft. of timber and 250,000 railway sleepers from British Guiana this year.

Instrument companies' agreement. Electro Mechanisms Limited, one of the King group of companies, has recently completed an agreement with the Schaevitz Engineering Company of New Jersey, U.S.A.

International compressor symposium. Mr. J. Hodge, Chief Engineer, Holman group, has been asked to lecture on rotary screw compressors at the International Symposium on Compressors, to be held in Prague from September 6-8.

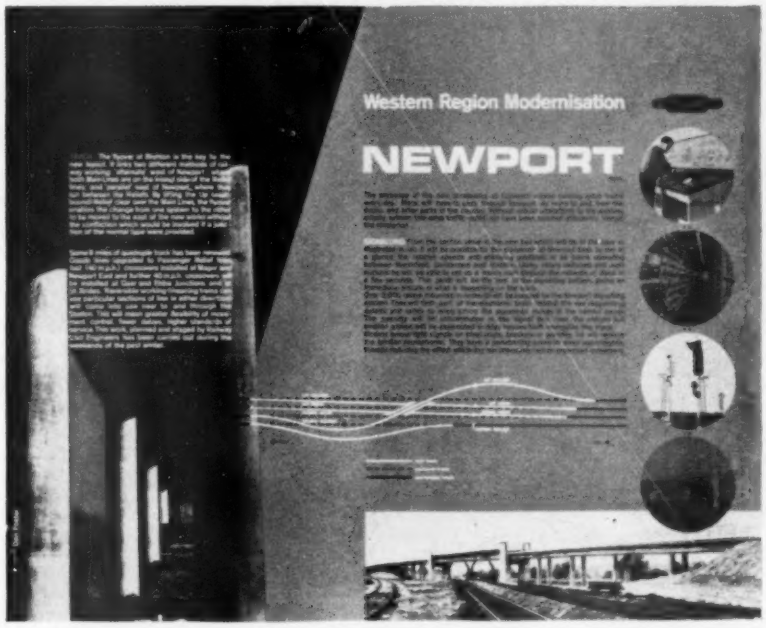
Increased steel export earnings. Net export earnings of the steel industry are likely to be even better than in 1959 when they reached £85 million and substantially better than 1960 when the figure was £14 million.

G.E.C. displays at exhibition. The General Electric Company of Schenectady will have displays at the Allied Railway Supply Association Exhibition in Chicago, from September 10-13. Photographs of the engine, electrical, and cooling systems of the U25B diesel-electric locomotive will be on display.

Railway cranes. The two largest railway cranes built in the United Kingdom have been supplied to the Quebec Cartier Mining Company by Cowans Sheldon & Co. Ltd. Both cranes are diesel-hydraulic and are designed to operate at temperatures down to minus 60 deg. F. They were designed and built in nine months and the 250-ton crane equals in capacity the largest yet built in the world.

Demolition of railway bridges in Barnsley. A number of railway bridges in Barnsley on the Eastern Region of British Railways is to be demolished. The bridges are no longer in use because of the reorganisation of train services. A start was made on Eldar Street bridge on August 20 and on subsequent weekends work will commence on Queens Road bridge and bridge No. 18 over Pontefract Road. Three more, for which dates for the work have not been decided, are also to be removed. They are: bridge No. 1 between Oakwell Junction and Stairfoot, and bridges 6 and 7 between Oakwell Junction and Old Oaks Junction.

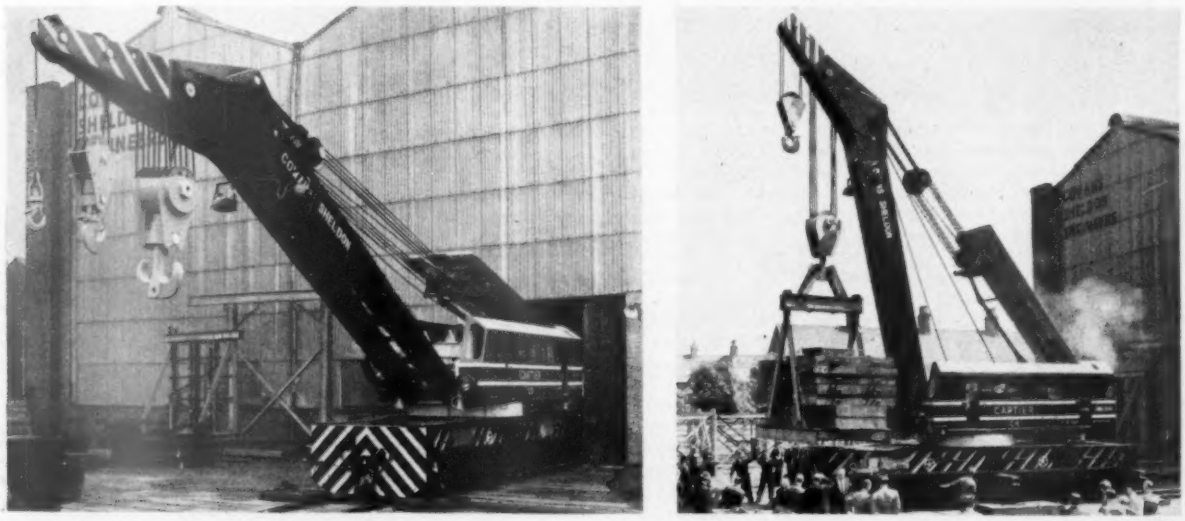
WESTERN REGION PUBLICITY



Explanatory poster issued by Western Region of British Railways

Expandite Limited annual report. In the annual report and statement of accounts for 12 months ended April 1 of Expandite Limited, the Chairman, Mr. Bertram Watson, stated that despite political and social unrest overseas, which had tended to disrupt trade, emphasis had continued to be placed on exports and oversea development. Exporting companies got little encouragement from the Government, and if and when it was sufficiently courageous to translate its words of exhortation into action it would be a memorable day. The overall trading position of the company would remain satisfactory despite recent Government measures, and it was suggested that the earnings of the group for the current year would be no less favourable than that under discussion.

Bus destination blinds in London. The London Transport Executive is to introduce destination blinds on buses with intermediate journey points printed in upper and lower case lettering. The final destination will remain wholly in capitals as at present. The illus-



Cowans Sheldon breakdown cranes for the Quebec Cartier Mining Company. (Left): 250-ton capacity; (right): 150-ton capacity

New style lettering (right) on London bus blinds

tration above shows examples of both former blinds and those now to be adopted.

Railway Stock Market

British Funds attracted attention and 3½ per cent War Loan again moved higher on balance.

The reactionary market conditions were reflected by lower prices for foreign rails, but most quotations were scarcely tested by dealings. Antofagasta stocks, which have recently attracted a good deal of attention, encountered profit-taking, and the ordinary stock came back from 22⅜ to 20⅜, while the preference stock was 35½, compared with 36 a week ago. United of Havana second income stock firmed up from 7 to 7½, and the consolidated stock was 1½, while elsewhere San Paulo Railway 3s. units remained at 2s. 3d. Mexican Central "A" bearer debentures were maintained at 59.

Costa Rica ordinary stock lost a point at 38½; the 6½ per cent second debentures were quoted at 125. Chilean Northern debentures were 48½, Guayaquil & Quito assented bonds 58, and Paraguay Central prior debentures 18. Salvador Railway consolidated stock was 3½.

International of Central America common shares fell to $14½, which compared with $17½ a week ago, while the quotation for the preferred stock was marked down from $103½ to $93. Among French railway sterling bonds, Midi 4 per cent remained at the lower level of 80 recorded a week ago.

Canadian Pacifics at $43½ compared with $43¾, and the preference stock at 55 was also virtually the same as a week ago, though the 4 per cent debentures, which give an attractive yield of 7½ per cent, improved from 52⅜ to 53½. White Pass shares eased to $11½.

Nyasaland Railways shares remained at 10s. 6d. with the 3½ per cent debentures at 32. Gedaref Railway & Development 5 per cent guaranteed debentures were 94xd. Elsewhere, Midland Railway of Western Australia ordinary stock was quoted at 11; the £1 units of second debentures were dealt in up to 11s. 9d. West of India Portuguese capital stock changed hands at 118.

Movements among shares of locomotive builders and engineers were small, but mostly showed declines compare with a week ago. Beyer Peacock 5s. shares at 6s. 9d. compared with 6s. 10½d., but G. D. Peters remained at 18s. 9d., though Charles Roberts 5s. shares rallied from 5s. 3d. to 5s. 6d. Westinghouse Brake were 33s. 6d. (compared with 33s. 9d.) and now yield 6½ per cent on the basis of last year's 11 per cent dividend. Birmingham Wagon remained at 21s. 3d. and North British Locomotive lost 6d. at 5s. 3d., but Wagon Repairs 5s. shares held last week's rise to 22s., though Gloucester Wagon 10s. shares receded further from 9s. 6d. to 9s.

Moderate losses ruled among electricals, A.E.I. at 35s. comparing with 35s. 9d. a week ago, while English Electric declined from 31s. to 30s. 3d. and G.E.C. from 29s. 9d. to 29s. 3d. Crompton Parkinson 5s. shares firmed up to 12s. reflecting market expectations that the dividend is likely to be held at 12½ per cent. B.I.C.C. have been well maintained at 58s. 6d.

Dowty Group 10s. shares were 33s. 6d. compared with 32s. 6d. a week ago, but Pressed Steel 5s. shares came back further from 21s. 3d. to 20s. Ransome & Marles 5s. shares held steady at 15s. 9d. and Pollard Bearing 4s. shares were 35s. Leyland Motors have been active around 99s. Vickers eased from 33s. 3d. to 33s., T. W. Ward gained 1s. 6d. at 73s. but Stone-Platt lost 1s. 6d. at 53s. 6d.

Forthcoming Meetings

August 26 (*Sat.*). The Railway Enthusiasts Club, tour of interesting lines in the London area. Open to non-members.

Sept. 2 (*Sat.*). Permanent Way Institution, London Section. Visit to Southampton Docks.

Sept. 16 (*Sat.*). The Permanent Way Institution, East Anglia Section, visit to Permali Limited, Gloucester.

Sept. 16 (*Sat.*). The South Bedfordshire Locomotive Club, special train over the freight-only, Welwyn Garden City to Hertford branch.

Sept. 16 (*Sat*). Railway Students Association, annual outing from Reading South Station.

Sept. 18 (*Mon.*). The Historical Model Railway Society. Talk, The Construction of Freight Rolling Stock, at Keen House, Calshot Street, N.1.

Sept. 21 (*Thu.*), The Model Railway Club, film show, at Keen House, Calshot Street, N.1.

OFFICIAL NOTICES

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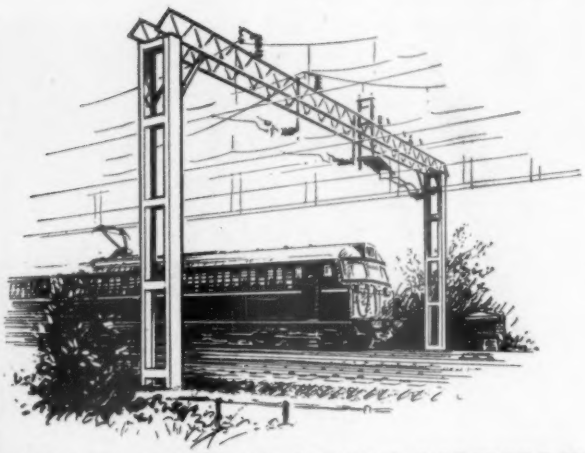

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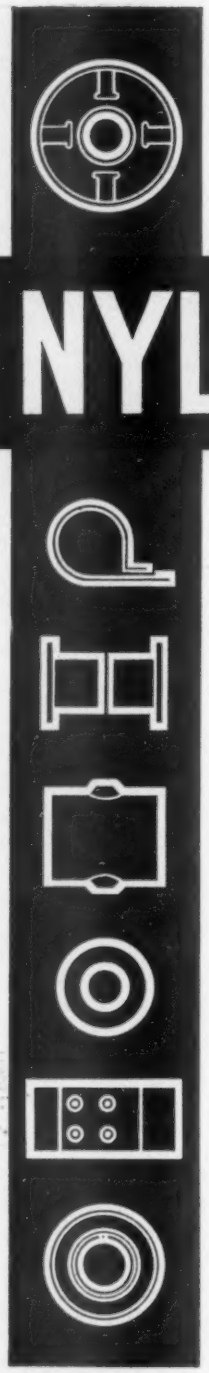

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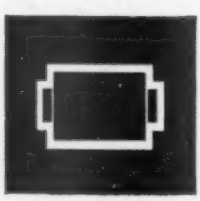

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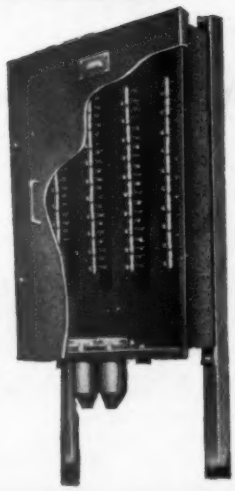

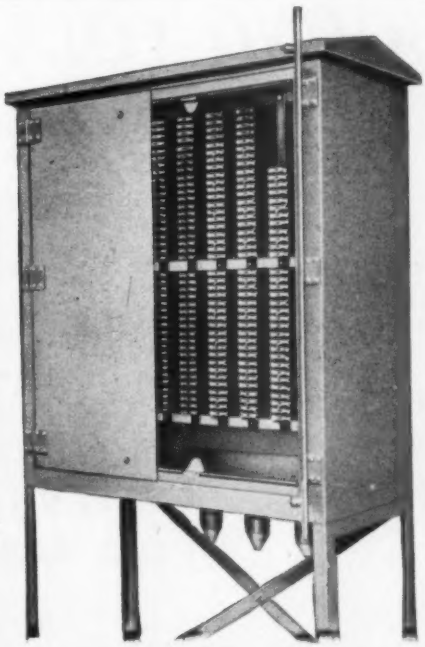

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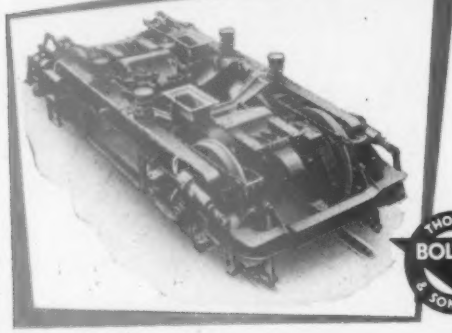

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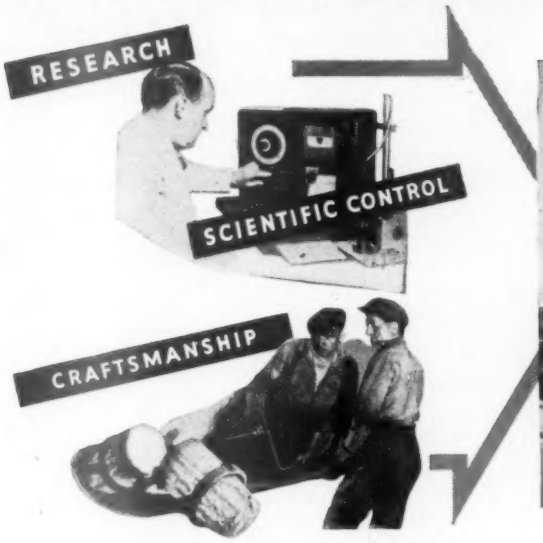

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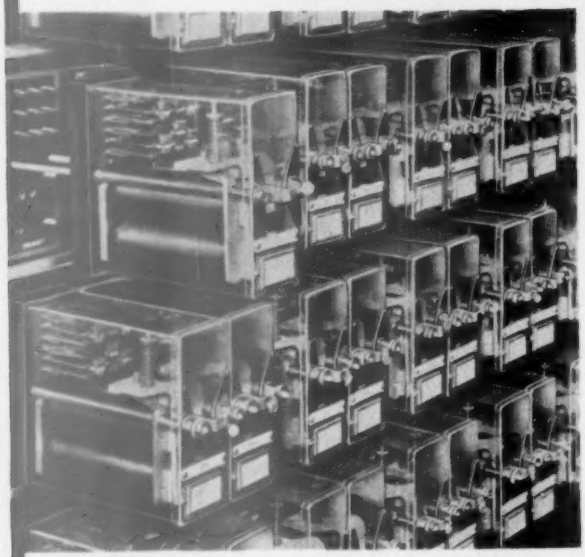

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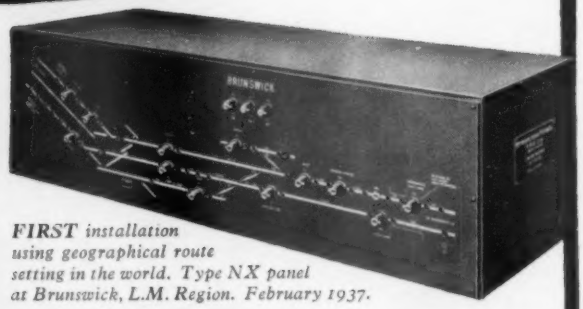

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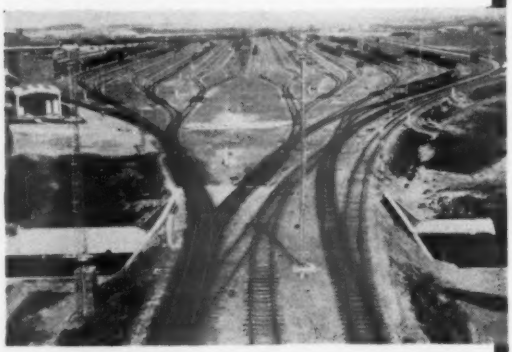

FIRST fully automatic marshalling yard in Europe. Margam, Western Region. April 1960.

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